

CSMS researchers Dr. Mukund Sibi and Dr. Andriy Voronov have CSMS research featured on ACS Sustainable Chemistry and Engineering cover

June 18, 2021

The research publication, 'Evaluation of 3-Allyl-5-vinylveratrole in Latex Copolymerization with an Acrylic Monomer from High Oleic Soybean Oil', was published in ACS Sustainable Chemistry and Engineering May 2021.

NDSU Research and Creative Activity posted a story about the feature, and the publication can be read on the ACS.org website.

Congratulations to Drs. Sibi and Voronov!

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Canceled – ND EPSCoR Annual State Conference scheduled for April 21st

March 20, 2020

The ND EPSCoR Conference, originally scheduled for April 21st, has been canceled due to COVID-19 concerns. While we are disappointed, this decision was made after careful consideration and consultation with numerous individuals who all concurred the safety and health of the participants, speakers, and staff is our highest priority. We will begin conversations soon about the potential to hold the conference this fall and will keep you informed of our decision. Absent a fall conference, we look forward to welcoming everyone to Fargo next spring for the 2021 ND EPSCoR Annual Conference.

The ND EPSCoR Conference is an annual event that brings together faculty, students, and the community in a celebration of research endeavors taking place within almost all of the state's higher education institutions.

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Dean Webster Plenary Speaker at recent Waterborne Symposium 2020

March 18, 2020

Dean Webster, CSMS faculty researcher Dean Webster, Professor and Chair in coatings and polymeric materials at North Dakota State University, was the Plenary Speaker at the 47th Annual Waterborne Symposium held February 16-21, 2020 in New Orleans, LA.

Webster's presentation topic was "Towards Sustainability in Coatings Technology: Progress, Opportunities, Barriers". His CSMS research primarily focuses on high performance thermosets derived from bio-based resins having unique molecular architectures.

The Symposium, conceived and founded by three faculty members of the Department of Polymer Science at the University of Southern Mississippi, has grown from a three day technical meeting to a week-long event with various activities. There are now three days of short courses before the technical meeting, as well as a technology showcase that is open for several days during the Symposium.

You can read more about The Waterborne Symposium at <https://www.waterbornesymposium.com/>, and read about this year's event at

[https://www.coatingsworld.com/contents/view\\_online-exclusives/2020-03-17/47th-annual-waterborne-symposium/](https://www.coatingsworld.com/contents/view_online-exclusives/2020-03-17/47th-annual-waterborne-symposium/).

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Muneer Shaik, CSMS researcher and UND graduate student, awarded Young Investigator travel award

March 3, 2020

Muneer Shaik, a graduate student at UND and a CSMS researcher, will receive a \$250 travel award for his oral presentation at the 2020 Red River Valley ACS Young Investigator Award competition held February 1st at Mayville State University.

Shaik's presentation, 'An efficient approach to cyclic, linear & block polyesters via ring opening polymerization using zinc amido-oxazolate complexes', placed 3rd and is based on CSMS research being conducted in Dr. Guodong Du's lab at the University of North Dakota.

The travel award will help offset Shaik's travel expenses to attend the ACS National Meeting being held March 22-26 in Philadelphia, PA. Shaik and the other award recipients will receive their travel awards following their attendance at the ACS National Meeting.

The Red River Valley ACS Young Investigator Award competition was open to graduate students and post-doctoral fellows from the Red River Valley area who are ACS members and who had submitted an abstract for the ACS National Meeting this month.

Congratulations to Muneer and the other travel award recipients!

Visit the Red River Valley ACS Section Facebook page

<https://www.facebook.com/RedRiverValleyACS> to see their posts about the Young Investigator Award competition.

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Dean Webster to speak at the Waterborne Symposium 2020

February 4, 2020

Dean Webster

Dean Webster, Professor and Chair in coatings and polymeric materials at North Dakota State University, and faculty researcher in CSMS, will be the Plenary Speaker at the 47th Annual International Waterborne, High-Solids and Powder Coating Symposium (The Waterborne Symposium 2020).

The Waterborne Symposium 2020 is being held February 16-21, 2020 at the Sheraton New Orleans Hotel in New Orleans, LA. Online registration is open until 11:59PM CT on February 12, 2020.

Webster's talk, "Towards Sustainability in Coatings Technology: Progress, Opportunities, Barriers", will be at 8am on Wednesday, February 19th. His CSMS research primarily focuses on high performance thermosets derived from bio-based resins having unique molecular architectures.

The Symposium, conceived and founded by three faculty members of the Department of Polymer Science at the University of Southern Mississippi, has grown from a three day technical meeting to a week-long event with various activities. There are now three days of short courses on Sunday-Tuesday before the technical meeting begins on Wednesday, as well as a technology showcase that is open Tuesday afternoon through Thursday afternoon.

You can read more about The Waterborne Symposium 2020 at <https://www.waterbornesymposium.com/>, and online registration is at <https://www.waterbornesymposium.com/register>.

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NDSU graduate student Alex Wittenberg awarded 3rd place for presentation on CSMS research December 11, 2019

Alex Wittenberg, North Dakota State University Plant Sciences graduate student and former CSMS undergraduate researcher, was awarded 3rd place for a CSMS-related presentation at the 2019 American Society of Agronomy (ASA) annual meeting held in San Antonio, Texas, Nov. 10-13.

Alex's presentation topic, "Sowing Date Affects Winter Camelina Stand Establishment", was within the Bioenergy Systems division of the Agronomy category and is based on CSMS research while an undergraduate under advisor Dr. Marisol Berti in Plant Sciences at North Dakota State University.

Alex was one of two NDSU Department of Plant Sciences students who was awarded for their presentation. Jesse Puka-Beals is the other NDSU Plant Sciences graduate student.

More information about these two students and their presentations can be read in a NDSU News post [HERE](#).

Congratulations to both Alex and Jesse!

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CSMS research presented by faculty and students at the 4th International Symposium on Materials from Renewables (ISMR) November 4, 2019

Zoriana Demchuk next to her CSMS poster at the 4th ISMR  
Zoriana Demchuk next to her CSMS poster at the 4th ISMR

Faculty and students from NDSU recently presented on their CSMS research at the 4th International Symposium on Materials from Renewables (ISMR) held October 9th and 10th in Athens, GA.

The ISMR symposium was co-organized by NDSU and the University of Georgia, with a goal of sharing research on converting renewable resources (for example, byproducts of agricultural production like wheat chaff, or even chicken feathers) into composites that can be used for

products like paints, coatings, coatings additives, adhesives, as well as packaging, textiles, and bottles.

NDSU faculty members Andriy Voronov and Mukund Sibi presented lectures on their research and served as co-organizers of the symposium (along with Dr. Dean Webster). Sibi's presentation described new methods for the synthesis of novel monomers from biomass. Voronov's lecture detailed the preparation of latex composites derived from renewable plant-based monomer mixtures and their feasibility in coatings applications.

Zoriana Demchuk, doctoral student in the Department of Coatings and Polymeric Materials at NDSU, presented a poster entitled "The Life Cycle Assessment of Soybean Oil-Based Acrylic Monomer Production." Demchuk's poster is based on results obtained in collaboration between the Voronov and Pourhashem groups within CSMS. Yehor Polunin, a first year graduate student in the Voronov group, presented a poster on "Fully-Biobased Latex Copolymers From Soy and Vanillin Derived Vinyl Monomers". This investigation is a collaborative work between the Voronov and the Sibi group. Karan Bansal, a second-year graduate student in the Department of Coatings and Polymeric Materials presented a poster on "Self-Assembled Nanoparticles Prepared Using Bio-Based Macromolecules for Functional Coatings."

The 5th International Symposium on Materials from Renewables will be held next at North Dakota State University on July 21-22, 2020.

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NDSU student and CSMS researcher Alex Wittenberg receives Best Student Oral Presentation award

October 25, 2019

Alex Wittenberg, NDSU Plant Sciences graduate student and former CSMS undergraduate researcher, received a Best Student Oral Presentation award at the Association for the Advancement of Industrial Crops (AAIC) 2019 annual meeting in Tucson, Arizona, Sept. 8-11.

There are five separate research divisions and Alex's presentation topic "Fall Sowing Dates in Camelina Affected Plant Density" was in the Oilseeds division. Alex's presentation is based on his CSMS research under Dr. Marisol Berti in the Plant Sciences department.

Alex was one of several students awarded at the conference. Congratulations to Alex and the other awardees!

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Chad Ulven named the 2019 NDSU College of Engineering Researcher of the Year

October 18, 2019

Chad Ulven

Chad Ulven

NDSU's College of Engineering recognized three individuals for their research work.

Chad Ulven, associate chair and professor of mechanical engineering, has been named the 2019 NDSU College of Engineering Researcher of the Year. Chad is a faculty researcher with CSMS. Congratulations Chad!

Also being recognized, Di Wu, assistant professor in the Department of Electrical and Computer Engineering, was named the College of Engineering Early Career Researcher of the Year, and Yanchao Li was named Graduate Student Researcher of the Year. Congratulations to Dr. Wu and Yanchao!

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CSMS wheat bran research at Mayville State included online in Agweek and Grand Forks Herald posts  
October 18, 2019

Khawaja Hossain Research being conducted on wheat bran by Dr. Khawaja Hossain's CSMS group at Mayville State University featured online this past summer at [agweek.com](http://agweek.com) and [grandforksherald.com](http://grandforksherald.com)

The Agweek post 'Research finds wheat bran could be used to treat water, clean oil spills' can be read at <https://www.agweek.com/business/agriculture/4631917-research-finds-wheat-bran-could-be-used-treat-water-clean-oil-spills>

The Grand Forks Herald post 'Students at Mayville State University are studying new ways wheat bran and chickpeas can be used to help the agriculture industry in the state' can be read at <https://www.grandforksherald.com/news/education/2735218-Mayville-State-research-finds-wheat-bran-could-be-used-to-treat-water-clean-oil-spills>

Hossain's wheat bran research project, including the wheat bran research being done by student Sean Pollack, is primarily supported by ND EPSCoR's Center for Sustainable Materials Science (CSMS).

A recent CSMS blog post about Hossain presenting on his wheat bran research, at the 7th International Conference on Smart Materials and Sustainable Technologies, includes links to several of his publications and can be read [HERE](#).

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Hossain presents CSMS research at international conference  
October 9, 2019

Dr. Khawaja Hossain CSMS researcher Khawaja Hossain, Professor of Biology at Mayville State University, presented on his wheat bran fiber research at the 7th International Conference on Smart Materials and Sustainable Technologies held April 8th and 9th in Toronto, Canada.

Hossain's research looks at the characteristics of wheat bran fiber and its potential to be a viable resource in thermoplastic biocomposites. Using wheat bran fiber in thermoplastic biocomposites offers several benefits including its being environmentally-friendly, reusable and recyclable.

Research into wheat bran fibers as a biobased alternative is just one of the materials being researched by Hossain and CSMS researcher Chad Ulven, Professor in Mechanical Engineering at North Dakota State University. Read more here about Hossain's presentation in a post by Mayville State University.

Hossain's CSMS-related publications include:

Rahman, A., Ulven, C. A., Johnson, M. A., Durant, C., & Hossain, K. G. (2017). Pretreatment of Wheat Bran for Suitable Reinforcement in Biocomposites. *Journal of Renewable Materials*, 5 (Suppl 1), 62–73.

DOI: 10.7569/JRM.2017.634133

Rahman, Atikur; Ulven, Chad; Durant, Cheyenne; Johnson, Maren; Fehrenbach, Joseph; Hossain, Khwaja. (2017). Selection, Pretreatment, and Use of Wheat Bran for Making Thermoplastic Composite. Presented at the American Society of Agricultural and Biological Engineers Annual Meeting (ASABE), 2017. Retrieved from <http://elibrary.asabe.org/azdez.asp?JID=5&AID=48030&CID=spo2017&v=&i=&T=1&refer=7&access=&dabs=Y>

DOI: 10.13031/aim.201701090

Hossain, K.G. (2019). Wheat Bran Fibers as Resources for Industries. Presented at the 7th International Conference on Smart Materials and Sustainable Technologies, 2019. Retrieved from

[https://www.researchgate.net/profile/Kingsley\\_Ukhurebor/publication/333080057\\_Smart\\_Materials\\_and\\_Sustainable\\_Technologies/links/5cda843fa6fdccc9ddaac05a/Smart-Materials-and-Sustainable-Technologies.pdf?origin=publication\\_detail](https://www.researchgate.net/profile/Kingsley_Ukhurebor/publication/333080057_Smart_Materials_and_Sustainable_Technologies/links/5cda843fa6fdccc9ddaac05a/Smart-Materials-and-Sustainable-Technologies.pdf?origin=publication_detail)

Other publications by CSMS researchers can be found on the CSMS publications page [https://csms-ndsuo.org/publications/publications\\_by\\_year/](https://csms-ndsuo.org/publications/publications_by_year/)

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Chad Ulven, NDSU professor and CSMS researcher, featured in NDSU News Inspiring Teacher article

August 22, 2019

Chad Ulven

Chad Ulven

A January, 2019 NDSU News article featured Chad Ulven as an Inspiring Teacher.

Chad has been a CSMS researcher since 2012, and his research focuses on biocomposites in areas such as bio-based composite development, environmentally friendly composites, characterization and modeling of bio-based composites and improving thermo-mechanical properties of bio-composites.

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CSMS and CRCS collaborative research on the use of diodegradable polymers in food packaging

August 14, 2019

Dilpreet Bajwa

Dilpreet Bajwa

Kerry Hartman  
Kerry Hartman

CSMS researcher Dr. Dilpreet Bajwa, North Dakota State University professor of mechanical engineering, and CRCS researcher Dr. Kerry Hartman, environmental science faculty member and academic dean at Nueta Hidatsa Sahnish College are conducting research on biodegradable polymers. They are looking into food packaging developed from bio-based polymers, with a focus on the use of polylactic acid, also known as PLA, and ways to enhance PLA film characteristics.

The collaborative idea was sparked by an ND EPSCoR Emerging Areas Seed award opportunity that provides funding for collaborations between ND EPSCoR's CSMS and CRCS research centers. Their collaborative research may result in a patent and has the potential to translate into new applications in the food packaging industry as well as in other industries.

ND EPSCoR funding is provided by the State of North Dakota and NSF EPSCoR Research Infrastructure Improvement Program Track-1 (RII Track-1) Cooperative Agreement Award OIA-1355466.

More information about the collaboration between Drs. Hartman and Bajwa can be found in the NDSU News announcement.

More information about the ND EPSCoR Emerging Areas Seed award recipients and their research topics can be found at the ND EPSCoR website.

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Two CSMS students receive travel awards for presentations at AAIC annual meeting  
August 13, 2019

Congratulations to Alan Peterson and Alex Wittenberg, CSMS researchers, for receiving travel awards for their oral presentations at the 30th annual meeting of the Association for the Advancement of Industrial Crops (AAIC) held September 23-26 in London, Ontario, Canada!

The travel awards from AAIC are to help offset the students' travel expenses from attending the AAIC annual meeting. Students conducting research with industrial crops are eligible for a travel award, and up to two awards are given to each of the standing divisions in AAIC.

Both Alan's presentation, Maximizing cover crop performance by interseeding cover crops into standing soybean, and Alex's presentation, Morphological characteristics of winter- and summer-biotypes of camelina, are from research conducted in Dr. Marisol Berti's CSMS research group. Alex's oral presentation is based on CSMS research conducted as an undergraduate student.

Alan is a graduate student at North Dakota State University (NDSU) and is expected to graduate May 2019 with a Masters degree in Plant Sciences. Alex graduated from NDSU May 2018 with a Bachelors degree in Crop and Weed Sciences and is now a graduate student at NDSU.

Read more about Alan's and Alex's travel award in the NDSU News announcement.

Congratulations again to Alan and Alex!

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CSMS student researcher Alex Wittenberg selected for the Russell and Anna Duncan Scholarship

August 12, 2019

Congratulations to Alex Wittenberg, graduate student and CSMS researcher at North Dakota State University, who was selected for the 2018-19 Russell and Anna Duncan Undergraduate Research Scholarship program.

Alex has worked on research in Dr. Marisol Berti's CSMS group since January 2018, and graduated in May with a Bachelor Degree in Crop and Weed Sciences. Alex did present on his undergraduate CSMS research September 25th at the 30th Annual Meeting of the Association for the Advancement of Industrial Crops (AAIC) held in London, Ontario, Canada.

The scholarship from the Russell and Anna Duncan scholarship program will enable Alex to continue his undergraduate research as a graduate student.

Read more about Alex and the Russell and Anna Duncan scholarship in the NDSU News announcement.

Congratulations again to Alex!

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Dean Webster named site-director for new I/UCRC research center to be housed at NDSU  
July 9, 2019

Dean Webster, Professor and Chair of the Coatings and Polymeric Materials department at NDSU, and our CSMS co-lead, has been named site-director for a new biobased materials research center to be set up at NDSU.

The new center will be a university site of the Center for Bioplastics and Biocomposites (CB<sup>2</sup>), a National Science Foundation Industry & University Cooperative Research Center (I/UCRC) focusing on developing high-value biobased products from agricultural and forestry feedstocks.

In addition to biobased research, the new center will include educational programs for undergraduate and graduate students, veterans and other instructors.

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Dr. Dean Webster receives PMSE Fellows honor  
June 13, 2019

Congratulations to CSMS researcher Dr. Dean Webster for being named a 2019 PMSE Fellow!



In February, PMSE (American Chemical Society's Polymeric Materials: Science and Engineering division) announced Dr. Webster and three others as their 2019 PMSE Fellows. They were inducted as the nineteenth class of PMSE Fellows at the Orlando ACS Meeting during the joint PMSE/POLY Awards Reception on April 3rd, 2019.

The four awardees include:

Dr. Dean Webster, Professor and Chair in the Department of Coatings and Polymeric Materials at North Dakota State University

Dr. Zhiqun Lin, Professor of Materials Science and Engineering at the Georgia Institute of Technology

Dr. Nicholas A. Peppas, Cockrell Family Regents Chaired Professor in the Departments of Chemical, Biomedical Engineering, Pediatrics, Surgery and Pharmacy, at the University of Texas at Austin

Dr. Jeffrey Pyun, Professor in the Department of Chemistry & Biochemistry at the University of Arizona

The principal objective of the PMSE Division is to promote interest in, and the understanding of, applied polymer science. This is achieved through regular meetings, publications, professional contacts, and discussions. Since its founding, the Division has regularly participated in American Chemical Society National Meetings. The Division frequently co-sponsors symposia with other ACS Divisions and is an active participant in the Macromolecular, Biotechnology, Catalysis & Surface Science, and Materials Science Secretariats.

The PMSE Fellows announcement can be read at <https://pmsedivision.org/2019/02/2019-pmse-fellows/#>

Congratulations to Dr. Webster and the other honorees!

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Alex Parent turns CSMS idea into Outreach with American Indian students in North Dakota  
June 13, 2019

Alex Parent, Assistant Professor in Chemistry at NDSU and CSMS researcher, took an idea this past year and turned it into an Outreach opportunity with ND EPSCoR's Sunday Academy program.

The Sunday Academy program, designed to generate interest in math, science, and engineering among American Indian high school students in North Dakota, is held at the five tribal colleges in North Dakota: Cankdeska Cikana Community College; Nueta Hidatsa Sahnish College; Sitting Bull College; Turtle Mountain Community College; and, United Tribes Technical College.

Faculty from NDSU and UND, as well as the tribal college Sunday Academy coordinators, are invited to submit STEM related topics, and seven topics are then chosen for the following year's program. The NDSU and UND faculty get together with tribal college coordinators during the 2nd week of ND EPSCoR's NATURE University Summer Camp, held in June, to turn their ideas into hands-on activities. Two topics, selected as all-site STEM modules, are taught in January

and February – hello Winter! – by the tribal college coordinators. The other five topics selected are led by the UND and NDSU faculty who travel once to each of the five tribal colleges between September-December and March and lead the activities for their STEM topic.

This past year, Alex turned his CSMS-related topic “Polymer Synthesis from Common Materials” into three activities: Modeling Molecular Structures; Crosslinking – Polymers to Plastics; and, Extracting PET strands from Soda Bottles.

Being involved in ND EPSCoR’s Sunday Academy program isn’t new to Dr. Parent. In 2017-2018, he traveled to the tribal colleges to lead activities for his CSMS-related topic “Recycling Bioplastics”, and in 2019-2020 he will have activities related to “Gold Nanoparticles”.

Alongside Dr. Parent’s lesson, the other topics from the 2018-2019 Sunday Academy program included:

“Understanding the anatomy of the eye” led by Dr. Ben Balas (NDSU, Psychology)

“Digital preservation of natural and cultural resources” led by Dr. Stephanie Day (NDSU, Geosciences)

“Influenza outbreak” led by Dr. Natasha Petry (NDSU, Pharmacy)

“Adaptation and climate change” led by Drs. Jill Hamilton and Pam Puppò (NDSU, Biological Sciences)

All-site lesson “Hypothesis and Product Testing” from Dr. Mafany Mongoh (Sitting Bull College, Environmental Sciences)

All-site lesson “Sentiment Analysis” from Dr. Ravi Yellavajjala (NDSU, Civil and Environmental Engineering)

More information about the Sunday Academy program can be found at

<https://www.ndepscor.ndus.edu/ndep/nature/sunday-academy/>. Previous years’ topics and their activities can be found through this same webpage link.

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Minot State student and CSMS researcher Tess Skinner gives oral presentation at Spring ACS National Meeting

May 14, 2019

Dr. Mikhail Bobylev and Tess Skinner

Tess Skinner (right) with her CSMS supervisor Dr. Mikhail Bobylev; photo is from the 2019 ND EPSCoR State Conference

Undergraduate student Tess Skinner from Minot State University gave a presentation on her CSMS research at the Spring 2019 ACS National Meeting held March 31 – April 4, 2019 in Orlando, Florida.

Tess made her oral presentation on the topic “Rapid synthesis of N,N-di-(4-chlorobenzyl)-N-methylamine” on the first day of the conference.

Tess, along with six other students from Minot State, traveled with Dr. Bobylev to the ACS National Meeting in Orlando. And, while at the national meeting, their Minot State University

ACS Student Chapter received an honorable mention award for their performance during the 2017-2018 academic year. Congratulations to their group!

More information about their trip can be read in two online posts – one from Minot State and one from the Minot Daily News.

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May 14, 2019

A journal article based on CSMS research published in the Journal of Coatings Technology and Research was picked up February 2019 by Coatings.SpecialChem.com at

[https://coatings.specialchem.com/news/industry-news/non-isocyanate-pu-coatings-000217375?lr=ipc19021434&li=20091227&utm\\_source=NL&utm\\_medium=EML&utm\\_campaign=ipc19021434&m\\_i=nPTnGAdGN6xNR7HrWrtbAxuL29ma60\\_7V0jVHRHL9iu75jNlx7ICi\\_IJXfuITtyPQUZKxQyIHrEyXhD0KEVANLia7ribn%2B](https://coatings.specialchem.com/news/industry-news/non-isocyanate-pu-coatings-000217375?lr=ipc19021434&li=20091227&utm_source=NL&utm_medium=EML&utm_campaign=ipc19021434&m_i=nPTnGAdGN6xNR7HrWrtbAxuL29ma60_7V0jVHRHL9iu75jNlx7ICi_IJXfuITtyPQUZKxQyIHrEyXhD0KEVANLia7ribn%2B)

Following is the abstract from the journal article:

Formulations of bio-based poly(cyclic carbonates) and amines using cooperative catalysis were studied to produce non-isocyanate polyurethanes (NIPUs). Concerns on the use of isocyanates as starting materials for polyurethanes (PUs) have risen due to their effects on human health after exposure and also because their synthesis involves the use of phosgene. Polyurethanes are highly versatile materials used in widespread industries such as automotive, building, construction, and packaging. They have also been used as flexible and rigid foams, adhesives, coatings, thermoplastic, or thermoset materials. Traditionally, PUs are synthesized from polyols and polyisocyanates. In order to circumvent the concerns, much research has been devoted to exploring alternative approaches to the synthesis of PUs. NIPU synthesis using cyclic carbonates and amines has gained popularity as one of the new approaches. In this study, novel bio-based resins were synthesized by converting epoxidized sucrose soyate into carbonated sucrose soyate (CSS) under supercritical conditions. Initial studies have shown promise in systems where CSS is crosslinked with multifunctional amines generating coatings with good solvent resistance. This work focused on studying the effect of catalysts and developing formulations of bio-based non-isocyanate polyurethane coatings.

A full list of publications from CSMS research, with links to articles, can be found at [https://csms-ndsu.org/publications/publications\\_by\\_year/](https://csms-ndsu.org/publications/publications_by_year/)

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Ulven presents CSMS research at the Third International Conference on Composites, Biocomposites and Nanocomposites

May 6, 2019

Chad Ulven presented on CSMS research related to his work with flax and hemp fibers at the 3rd International Conference on Composites, Biocomposites and Nanocomposites held November 7-9, 2018 in Port Elizabeth, South Africa.

Using natural fibers is environmentally-friendly and using natural fibers from North Dakota crops is a value add-on for the rural economy in North Dakota.

Read more about Ulven's presentation and research at NDSU News

Publications related to Ulven's research can be found on the CSMS Publications page. Here are just a few:

Long-term behavior of bio-composites for structural applications | 2016 Composites and Advanced Materials Expo (CAMX); DOI: 10.13140/RG.2.2.33964.87682  
Pretreatment of Wheat Bran for Suitable Reinforcement in Biocomposite | Journal of Renewable Materials; DOI: 10.7569/JRM.2017.634133  
Standard Density Measurement Method Development for Flax Fiber | Industrial Crops and Products; DOI: 10.1016/j.indcrop.2016.11.060  
Selection, Pretreatment, and Use of Wheat Bran for Making Thermoplastic Composite | 2017 ASABE; DOI: 10.13031/aim.201701090  
The potential of natural composite materials in structural design | Sustainable Composites for Aerospace Applications; DOI: 10.1016/B978-0-08-102131-6.00013-X

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CSMS researchers assessing flax fiber reinforced biocomposites for potential application as replacements for traditional composites

May 2, 2019

Chad Ulven

Chad Ulven

MD Zahirul Islam shows biocomposite from flax

MD Zahirul Islam shows biocomposite from flax

CSMS researcher Dr. Chad Ulven, North Dakota State University professor of mechanical engineering, and MD Zahirul Islam, NDSU graduate student and CSMS researcher, are

assessing flax-fiber reinforced biocomposites for potential application as replacements for traditional composites.

Ulven and Islam's research is filling a gap in knowledge as they assess strengths and weaknesses of flax-reinforced biocomposites. Biocomposites are an environmentally-friendly and lower cost alternative to some materials using traditional composites such as non-degradable fiberglass and petrochemicals. With a variety of industries using biocomposites, the addition of flax fiber reinforced biocomposites would result in not only environmental benefits but also economic benefits. Flax production in the U.S. is primarily in North Dakota, with some production in Montana and South Dakota.

CSMS is funded by ND EPSCoR. ND EPSCoR funding is provided by the State of North Dakota and NSF EPSCoR Research Infrastructure Improvement Program Track-1 (RII Track-1) Cooperative Agreement Award OIA-1355466.

More information about this flax fiber research can be read in a news post in NDSU News. Publications related to CSMS research can be found on the CSMS Publications page.

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CSMS student researcher from Minot State University wins for oral presentation  
April 30, 2019

Jordan Torgunrud, undergraduate student at Minot State University, won first place for her oral presentation titled 'Scalable synthesis of cancer preventing benzylmorpholines' at the 12th annual Northwest Region Meeting "Undergraduate Research in the Molecular Sciences".

Jordan traveled with her CSMS supervisor Mikhail Bobylev and 9 other students to the event held at Minnesota State University-Moorhead on October 21, 2017. Her presentation was based on CSMS research supported by ND EPSCoR.

Jordan's presentation win included a \$500 travel award to attend the 255th National Meeting of the American Chemical Society in New Orleans, La., March 18-22, 2018.

Congratulations Jordan!

Read more in the announcement from Minot State University

UPDATE: Jordan's presentation at the 255th National Meeting of the American Chemical Society was also titled 'Scalable synthesis of cancer preventing benzylmorpholines'

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CSMS student researcher Rebecca Haller receives Honorable Mention at NDSU EXPLORE undergraduate research showcase  
April 26, 2019

Rebecca Haller, NDSU undergraduate student and CSMS researcher, receives poster session honorable mention at the 2019 NDSU EXPLORE undergraduate research showcase.

Haller presented on the topic Chemoselective Oxidations of 5-(Hydroxymethyl)furfural and its Derivatives at the NDSU EXPLORE showcase held April 11th at NDSU. The announcement from NDSU News can be read [here](#).

The NDSU EXPLORE showcase is an annual event held to celebrate the scholarly accomplishments of NDSU undergraduate students. Whether their major is in the sciences, engineering, business, arts or humanities, NDSU EXPLORE is an opportunity for undergraduates students to showcase their research and scholarly activities. Their work can be in progress and can be displayed in whatever format is appropriate, whether in a poster, oral presentation, video, table display, etc.

Haller is a member of Dr. Mukund Sibi's CSMS research group, funded by ND EPSCoR, and recently presented on this same CSMS topic at ND EPSCoR's annual conference March 27th.

Congratulations to Rebecca and all of the other NDSU EXPLORE poster session honorees!

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Dr. Chad Ulven selected to give NDSU's 58th Faculty Lectureship, April 2 at 7 pm, in Century Theater, Memorial Union  
March 31, 2019

Congratulations to Dr. Chad Ulven, Professor and Associate Chair in Mechanical Engineering at North Dakota State University for being selected to give NDSU's 58th Faculty Lectureship!

The lectureship will be at 7pm, April 2, 2019 in NDSU's Memorial Union Century Theatre. A reception will follow in the Butte Lounge.

The faculty lectureship recognizes sustained professional excellence in teaching, scholarly achievement, and service among current faculty at NDSU, and is conferred on an individual who has demonstrated excellence in all three areas.

More about the lectureship awardee announcement can be found at <https://www.ndsu.edu/news/view/detail/37012/>

More about the NDSU Faculty Lectureship award and nomination criteria can be found at [https://www.ndsu.edu/provost/administrative\\_units/facultyaffairs/awards/faculty\\_lectureship/](https://www.ndsu.edu/provost/administrative_units/facultyaffairs/awards/faculty_lectureship/)

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Dr. Surojit Gupta, CSMS/CRCS Emerging Areas Seed awardee, receives Young Leader Professional Development award from TMS  
March 28, 2019

Congratulations to Dr. Surojit Gupta, Associate Professor in Mechanical Engineering at the University of North Dakota for receiving the FMD Young Leaders Professional Development award from The Minerals, Metals & Materials Society (TMS)!

TMS honored Dr. Gupta and others with awards at the TMS 2019 Annual Meeting & Exhibition held March 10-14, 2019 in San Antonio, Texas. TMS has five technical divisions and Dr. Gupta's award falls under their Functional Materials division (FMD). News about this year's TMS awards and awardees can be found at <https://www.newswise.com/articles/tms-honors-2019-awardees>. The UND University Letter also announced the TMS award to Dr. Gupta.

The purpose of the FMD Young Leaders Professional Development awards are:

To enhance the professional development of young, dynamic and committed members through leadership opportunities and networking.

To foster an appreciation and desire among young members to play an active role in TMS and advance to volunteer leadership positions in the society in the future.

More information about the FMD Young Leaders Professional Development award can be found [here](#).

More information about Dr. Gupta's CSMS/CRCS related research under ND EPSCoR's Emerging Areas Seed award can be found at

<https://www.ndepscor.ndus.edu/funding/awardees/emerging-areas-seed-awardees/>

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Dr. Ghasideh Pourhashem presents at Science Café event March 5, 2019  
March 22, 2019

On March 5th, Dr. Ghasideh Pourhashem, Assistant Professor in the Department of Coatings and Polymeric Materials at North Dakota State University, presented a Science Café in Stoker's Basement at Hotel Donaldson on The Secret Life of Things: A voyage into an environmentally conscious consumption.

In her abstract, she summarized her talk as follows:

Everyday new products that are designed to serve us better and make our lives easier enter the market. All products, during their life time, directly or indirectly, interact with their surrounding environment and people. These interactions can potentially result in short- and long-term harmful (or beneficial) effects, which may also lead to socio-economic consequences. Many of the unwanted health and environmental impacts of products can be avoided or mitigated if elements of sustainability are considered in their design and life cycle. But when designing new products, what tools scientists/engineers and producers have to ensure that on a bigger scale making and consuming those products is not harming people and the environment? How this information can help us make better choices when selecting products? Are there any tools for consumers to make informed and responsible decisions?

Information on faculty Science Cafés at Stoker's Basement, Hotel Donaldson, 101 N Broadway, Fargo, ND, can be found at <http://earth.physics.ndsu.nodak.edu/>

Information about faculty Science Cafés at Half Brothers Brewing Company, 17 N 3rd St, Grand Forks, ND, can be found at <http://faculty.atmos.und.edu/kennedy/STEM/index.html>

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Dr. Alena Kubátová presents at Science Café event Nov. 13, 2018  
March 22, 2019

Dr. Alena Kubátová, Chester Fritz Distinguished Professor, Department of Chemistry, University of North Dakota, gave a Science Café talk in Stoker's Basement on November 13, 2018.

Alena's talk, Chemical analysis as CSI investigation: From biofuels to atmospheric particles, relates to her work with CSMS and covered the following (from her abstract):

“Everything around us consists of chemical compounds, yet often we do not know what they are. A single chemical or even a single atom position can change a chemical from being benign and useful to a nasty toxin. In addition, chemicals often occur as mixtures of hundreds if not thousands of individual components, for example, atmospheric particles or particulate matter. Among them, some chemicals are key to cloud condensation, climate change and human health. When designing new biofuels as complex mixtures, we also need to understand the individual components to be able to assess their potential or predict impact on our life. But, how do we go about it and how can we trust the data obtained?”

Information on faculty Science Cafés at Stoker's Basement, Hotel Donaldson, 101 N Broadway, Fargo, ND, can be found at <http://earth.physics.ndsu.nodak.edu/>

Information about faculty Science Cafés at Half Brothers Brewing Company, 17 N 3rd St, Grand Forks, ND, can be found at <http://faculty.atmos.und.edu/kennedy/STEM/index.html>

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New newsletter highlights CSMS research

January 16, 2019

Interested in learning more about what's going on with CSMS research?

ND EPSCoR has started a monthly newsletter called News and Notes to spotlight ND EPSCoR-funded activities. In addition to providing information on ND EPSCoR's two research centers (publications, presentations, patents, etc.), the newsletter may feature activities of other ND EPSCoR programs (summary of other programs), individual participant news, and notices about upcoming events and funding opportunities.

The newsletters can be found on the ND EPSCoR website within the News and Events section. The direct link is <https://www.ndepscor.ndus.edu/news/newsletters/>.

So, read what's new with CSMS researchers and, go ahead, bookmark the newsletter webpage — you know you want to.

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Congratulations to Dr. Webster for receiving a patent related to his ND EPSCoR-funded CSMS research!

Dr. Webster (center) with Senator John Hoeven (left) and Director of the U.S. Patent and Trademark Office (USPTO) Andrei Iancu (right). Photo courtesy of Emily Schubert at NDSU's Research and Tech Park



Dr. Webster – Professor and Chair of NDSU’s Coatings and Polymeric Materials department, and CSMS faculty researcher – received the patent on November 30, 2018 following a roundtable hosted by Senator John Hoeven.

The roundtable brought together Andrei Iancu, Director of the U.S. Patent and Trademark Office (USPTO), and local researchers and business leaders. Dr. Hoeven organized the meeting to give Iancu firsthand knowledge about the needs of North Dakota’s entrepreneurs and businesses in protecting their intellectual property.

More information about the roundtable and the patent announcement can be read in a news released posted by Senator Hoeven’s office at <https://www.hoeven.senate.gov/news/news-releases/hoeven-holds-roundtable-with-uspto-director-local-researchers-and-business-leaders-to-discuss-securing-intellectual-property-opportunities-in-tech-development>.

The inventors for the patent, Biobased cyclic carbonate functional resins and polyurethane thermosets therefrom, include:

Dr. Webster

Previous CSMS participant James Docken, Jr. (as a graduate student)

Previous CSMS participant Satyabrata Samanta (as a Postdoctoral researcher)

James Bahr (Senior Research Engineer with NDSU’s Research and Creative Activity).

ABSTRACT:

The invention relates to a resin having a plurality of cyclic carbonate groups comprising the reaction product of: a) an epoxidized sucrose fatty acid ester resin, and b) carbon dioxide where a) and b) are reacted under conditions sufficient to carbonylate a plurality of the oxirane groups of the epoxidized sucrose fatty acid ester resin, and optionally in the presence of a catalyst or of a solvent. In one embodiment the epoxidized sucrose fatty acid ester resin is epoxidized sucrose soyate. The invention also relates to methods for producing a resin having a plurality of cyclic carbonate groups. In a method of the invention, an epoxidized sucrose fatty acid ester resin is contacted with carbon dioxide under conditions sufficient to carbonylate a plurality of the oxirane groups of the epoxidized sucrose fatty acid ester resin, and optionally in the presence of a catalyst or of a solvent. Other embodiments of the invention relate to curable composition containing a) a resin having a plurality of cyclic carbonate groups; b) an alkyl amine curing agent having two or more reactive amine groups; and c) optionally, a catalyst; and cured compositions and articles.

Congratulations again to Dr. Webster and his CSMS research group!

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Dr. Chad Ulven recently showcased his work on plastics at a NDSU Science Café event in downtown Fargo. As part of CSMS, Ulven researches how we can make plastic products more sustainable, with an eye on both the production/recycling cycle and on innovative end-user applications. He led the Science Café audience through a discussion of why our global use of plastics creates mounting problems, what some of the solutions for addressing this problem may look like, and how he and his team have created a wide range of recyclable plastics applications that are useful and usable from an end-user perspective.

#### PRESENTATION ABSTRACT:

Over the past couple decades, a severe growing concern over the amount of plastic waste piling up in our oceans, landfills, and scattered across our landscape has emerged. Over 380 million tons of plastic is produced per year worldwide. At our current rate of disposal, it is predicted that by 2050 there will be a greater amount of plastic mass in our oceans than sea life. Evidence of numerous environmental consequences to wildlife, wildlife habitat, and humans have been documented and various organizations have begun to focus specially on addressing ocean plastic, plastic bags, plastic straws, etc. to help remediate these problems. However, is this enough? What else do we need to do? When you finish your leftovers from last night's restaurant, what do you do (along with all your neighbors) with the polystyrene foam container? Local and regional recyclers of plastics cannot keep up nor handle all of the different types of plastics that can be recycled because of a gross lack of infrastructure and post recycling distribution. This presentation will explore these issues more deeply as well as others related to plastic waste, talk about some potential solutions, but most of all start an important conversation about what we should do next?

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Upcoming Science Café events can be found at <http://earth.physics.ndsu.nodak.edu/>

Alena Kubátová, Chester Fritz Distinguished Professor, Professor in Analytical Chemistry at the University of North Dakota, is a researcher with CSMS and will be giving a Science Café presentation on Tuesday, November 13<sup>th</sup>

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CSMS student Anna Renner wins best poster  
August 3, 2018

Congratulations to Anna Renner for winning best poster at the 22nd Annual Green Chemistry and Engineering Conference!

Anna Renner, second from left, poses with the 2nd place winner and others at the 22nd Annual Green Chemistry and Engineering Conference. \* This photo is from the conference's photo gallery found at <http://www.gcande.org/about/past-conferences/2018-highlights/>

Anna Renner attended the 22nd Annual Green Chemistry and Engineering Conference held June 18-20 in Portland, Oregon to give a poster presentation on research she was conducting in the Center for Sustainable Materials Science.

Renner's presentation, Synthesis of bio-derivable reactive diluents for styrene replacement in sustainable polymers, was based on her CSMS research under the direction of Dr. Mukund Sibi. Eric Serum, a graduate student at North Dakota State University, was also involved in the research Anna presented on.

As mentioned in a previous CSMS post, Anna has been involved in CSMS research under Dr. Mukund Sibi at North Dakota State University (NDSU) since January 2017 and graduated May 2018 with her Bachelor of Science in Chemistry. She is currently a lab technician in Chemistry

and Biochemistry at NDSU, and she plans to begin graduate studies in chemistry at Harvard University Fall 2018.

Congratulations again to Anna on her first place poster award!

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CSMS researcher Dr. Alena Kubátová receives Chester Fritz Distinguished Professorship  
July 6, 2018

Congratulations to CSMS faculty researcher Dr. Alena Kubátová for receiving the Chester Fritz Distinguished Professorship!

Dr. Kubátová, Professor in Chemical Engineering at the University of North Dakota, Dr. Alena Kubátová has been involved in CSMS research since May 2016. She has also been involved in several other ND EPSCoR-funded programs for students as an advisor to recipients of the following ND EPSCoR funding opportunities:

Advanced Undergraduate Research Award (AURA) Graduate Student Research Award (GSRA) Doctoral Dissertation Assistantship (DDA) funding

In addition, Dr. Kubátová was a recipient of ND EPSCoR WISE funding Spring 2017. WISE, acronym for Women in Science and Engineering, is designed to help expand efforts to increase female participation in STEM disciplines and to increase the capacity of investigators to compete more effectively for additional grant funding.

Dr. Kubátová has also been involved in ND EPSCoR's NATURE program – Nurturing American Tribal Undergraduate Research and Education – by providing a lab tour to NATURE University Summer Camp participants June 2017.

Congratulations again to Dr. Kubátová for being honored with UND's Chester Fritz Distinguished Professorship!

You can read more about Dr. Kubátová and the Professorship honor in this UND University Newsletter article

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Two students who have worked on CSMS research receive prestigious NSF Graduate Research Fellowships

July 5, 2018

Congratulations to CSMS participant Anna Renner for receiving a prestigious NSF Graduate Research Fellowship!

Anna with her CSMS poster presented at the April 2018 ND EPSCoR Annual State Conference.

Anna has been involved in CSMS research, under Dr. Mukund Sibi at North Dakota State University (NDSU), since January 2017 and graduated May 2018 with her Bachelor of Science in Chemistry. She is currently a lab technician in Chemistry and Biochemistry at NDSU, and she plans to begin graduate studies in chemistry at Harvard University Fall 2018. During the time

Anna has been involved in CSMS research, she has made the following poster presentations related to her CSMS research under Dr. Sibi:

Bio-Derivable Alkoxybenzenes for the Synthesis of Sustainable Polymers  
Preparation of a Novel, Bio-Derivable Crosslinker for Polymer Synthesis  
Preparation of Bio-Derivable Reactive Diluents for Polymer Synthesis  
Synthesis of Bio-Based Reactive Diluents as Styrene Alternatives  
Synthesis of Bio-Derivable Reactive Diluents for Styrene Replacement  
in Sustainable Polymers  
Synthesis of Biomass-Derived Furan-Based Ethers  
Synthesis of Cirsiumaldehyde: A Reaction Optimization Study  
Congratulations again to Anna, and best wishes to her on her graduate studies at Harvard!

More information about Anna and another NDSU student who received the Fellowship this year can be read in this NDSU News article

Congratulations to Katelyn Randazzo, previously a participant in CSMS research Fall 2013 to May 2016 under Dr. Qianli Chu at the University of North Dakota, who also received a NSF Graduate Research Fellowship in 2018. While involved in CSMS research, Katelyn made the following poster presentations and has been included in several publications:

Presentations:

Commercial Floodlights: A Promising Resource in Photochemistry  
Floodlight Photochemistry: From a Classic Photoreaction to Cutting-Edge Application  
Incandescent Light: A Promising Radiation Source in Photochemistry  
Lighting the Way to Accessible Solid-State Photochemical Synthesis: Incandescent Lights as a Facile Source of Ultraviolet Radiation  
Lighting the Way to Greener Chemistry: Incandescent Floodlights as a Facile UV Light Source for Classic and Cutting-Edge Photoreactions  
Lighting the Way to Greener Chemistry: Incandescent Lights as a Promising Source of Ultraviolet Radiation

Publications:

Randazzo, K.; Wang, Z.; Wang, Z.D.; Butz, J. and Chu, Q.R. (Available online July 2016).  
Lighting the Way to Greener Chemistry: Incandescent Floodlights as a Facile UV Light Source for Classic and Cutting-Edge Photoreactions, ACS Sustainable Chem. & Eng., 4(9), 5053-5059.  
DOI: 10.1021/acssuschemeng.6b01506  
Wang, Z.; Kastern, B.; Randazzo, K.; Ugrinov, A.; Butz, J. Seals, D.W.; Sibi, M.P. and Chu, Q.R. (2015). Linear polyester synthesized from furfural-based monomer by photoreaction in sunlight, Green Chemistry, 17, 4720-4724.  
DOI: 10.1039/C5GC01783A  
Wang, Z.; Randazzo, K.; Hou, X.; Simpson, J.; Struppe, J.; Ugrinov, A.; Kastern, B.; Wysocki, E. and Chu, Q.R. (2015). Stereoregular Two-dimensional Polymers Constructed by Topochemical Polymerization, Macromolecules, 48(9), 2894-2900.  
DOI: 10.1021/acs.macromol.5b00109

Wang, Zhihan.; Miller, B.; Butz, J.; Randazzo, K.; Wang, Zijun D. and Chu, Q. (2017).  
Polyladderane Constructed from Gemini Monomer via Photoreaction. *Angewandte Chemie*  
(International ed. in English), 56, 12155-12159.  
DOI: 10.1002/anie.201705937

Congratulations again to Katelyn as you continue your studies!

Anna and Katelyn are two out of three individuals who have received a NSF Graduate Research Fellowship in the last two years who have been involved in a ND EPSCoR sponsored program.

Alec Redmann, Summer and Fall 2014 participant in ND EPSCoR's STTAR program, Students in Technology Transfer And Research, received his Fellowship in 2016. You can read more about Alec in this UND University News article.

Congratulations to Alec!

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UPDATE: Richland #44 Students Win!! | Dr. Chad Ulven advisor/mentor for Richland #44 eighth grade students for Samsung Solve For Tomorrow competition  
March 29, 2018  
Chad Ulven

Dr. Chad Ulven, CSMS researcher, using his experience with bio-based renewable materials, advised and mentored eight eighth grade students at Richland #44 High School in Colfax, North Dakota as they sought a project idea that would fix a problem in their community.

UPDATE: Richland #44 students win \$25,000 in Samsung Technology!!

Stories on the internet about this competition and the Richland #44 students:

- \* <https://www.ndsu.edu/news/view/detail/32062/>
- \* [http://www.wahpetondailynews.com/news/richland-students-earn-k-in-national-competition/article\\_10f34aa0-ea8d-11e7-b6e9-4f9225ede11f.html](http://www.wahpetondailynews.com/news/richland-students-earn-k-in-national-competition/article_10f34aa0-ea8d-11e7-b6e9-4f9225ede11f.html)
- \* <http://kfgo.com/podcasts/ag-news-leader/1694/richland-44-students-win-national-contest/>
- \* <https://www.businesswire.com/news/home/20171214005837/en/51-Schools-Named-State-Winners-Samsung's-2>
- \* <https://news.samsung.com/us/2018-samsung-sft-51-state-winners-schools-steam-contest/>
- \* <https://www.samsung.com/us/solvefortomorrow/dist/assets/other/datawinners.pdf>
- \* <http://www.richland.k12.nd.us/wp-content/uploads/2018/02/February2018compressed.pdf>
- \* <https://www.facebook.com/SenatorHeidiHeitkamp/posts/1629848943705132>
- \* <https://twitter.com/i/web/status/946467961035984898>
- \*

<http://richland44schooldistrict.weebly.com/uploads/1/2/6/4/12644392/january2017.compressed.pdf>

\* <http://www.southdakotateacher.com/pdf/01-Samsung.pdf>

\* <https://www.scoopnest.com/user/SenatorHeitkamp/946467961035984898-congrats-to-these-richland-44-eighth-graders-on-taking-first-in-nd-in-the-solve-for-tomorrow-contest-good-luck-with-your-innovative-drainage-system-idea-as-you-prepare-for-nationals>

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German magazine Hemp ran an article November 2017 titled “Hemp: The green solution for our plastic addiction” about the current corporate landscape of hemp fiber bioplastics and biomaterials in North America.

The article included sustainable material research being conducted by Chad Ulven, CSMS researcher, both in CSMS and with his company c2renew.

The translated article can be read [HERE](#)

The original article at [www.hanf-magazin.com](http://www.hanf-magazin.com) can be read [HERE](#)

CSMS research is funded by National Science Foundation (NSF) EPSCoR Track-1 award # IIA-1355466

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CSMS RESEARCH INTO ALTERNATIVE USES FOR WHEAT BRAN WAS FEATURED BOTH IN MAYVILLE STATE UNIVERSITY PRESIDENT’S WEEKLY TRAILL COUNTY TRIBUNE COLUMN DECEMBER 2017, AND IN A TRAILL COUNTRY TRIBUNE ARTICLE ON MARCH 17, 2018

CSMS faculty researchers Khwaja Hossain and Atikur Rahman from Mayville State University and Chad Ulven from North Dakota State University, along with Mayville State undergraduate students are researching alternative uses for wheat bran.

Bran, the outer hard layer of the wheat kernel, is often removed in processing when wheat is refined and either sold at an extremely low price or disposed of as waste.

Given that North Dakota is a major wheat-producing state, ranking 2nd in 2016 in all wheat production<sup>1</sup>, alternative uses for wheat bran can make the bran by-product an important and profitable commodity for wheat farmers.

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Graduate and undergraduate students present original research at NSF site visit  
Graduate and undergraduate students from across North Dakota had the opportunity to present original research they have been conducting under the guidance of faculty affiliated with the Center for Sustainable Materials Science (CSMS) and the Center for Regional Climate Studies (CRCS), both funded by ND EPSCoR. The students worked with their advisor and with CSMS/CRCS communication personnel to design their poster, practice their presentation, and

articulate a cohesive vision of how their work fits in with their teams, with ND EPSCoR, and with the needs of the State and its citizens. The posters were displayed and presented during a closed-door session with the NSF Site Visit panelists.

The students who participated are listed below, along with the related research center, their institution and ND EPSCoR Advisor and the title of their poster presentation. The names are in order as shown left to right in the photo further below, with 1st row names listed first, then 2nd row names:

Cheyenne Durant, CSMS, Mayville State University/Khwaja Hossain. Pretreatment and Use of Wheat Bran for Reinforcement in Injection Molded Polypropylene Composites.

Anna C. Renner, CSMS, North Dakota State University/Mukund Sibi. Bio-Derivable Alkoxybenzenes for the Synthesis of Sustainable Polymers.

Jordan Torgunrud, CSMS, Minot State University/Mikhail Bobylev. Rapid Synthesis of N-(4-methoxybenzyl)morpholine.

Krystal Grieger, CSMS, North Dakota State University/Mukund Sibi. Synthesis of Novel Dicarboxylic Acids from Biomass.

Jon Starr, CRCS, University of North Dakota/Jianglong Zhang. Connecting Interdisciplinary Models and Remote Sensing Techniques to Improve Resolution of Crop Simulations in the Northern Great Plains Region.

Soklida Hong, CRCS/CSMS, North Dakota State University/Eakalak Khan. Fate of Biobased Materials in Aquatic Environments: Potential Impact on Physical, Chemical, and Biological Characteristics of Receiving Waters.

Dan Dixon, CRCS, University of North Dakota/Haochi Zheng. Modeling Honey Bee Suitable Habitat in North Dakota Using Land Use and Insecticide Intensity.

Jonas M. Sahouani, CSMS, North Dakota State University/Dean Webster. Highly Functional Methacrylated Bio-based Resin Systems for UV and Visible Light-Curable Coatings.

Kara Bauer, CRCS, University of North Dakota/Cindy Juntunen. Predicting Rural and Frontier Students' Environmental Science Considerations and Intentions.

Arvin Z. Yu, CSMS, North Dakota State University/Dean Webster. Bio-based Flax Fiber Composites from Bio-based Resins.

Billi Jean Peterman, CRCS, Dickinson State University/Eric Brevik. Land Management Changes and its Effects on Soil Microbial Communities.

Mohsen Tahmasebi Nasab, CRCS, North Dakota State University/Xuefeng Chu. Integrated Hydrologic Modeling (IHM) and Hydrologic Monitoring.

Austin King, CRCS, University of North Dakota/Aaron Kennedy. Severe Weather Environments of the Northern Plains.

Hayden Zander, CRCS, Valley City State University/Andre DeLorme. Dragonfly Distribution Changes May Indicate Climate Change in North Dakota.

Rahul Shahni, CSMS, University of North Dakota/Qianli 'Rick' Chu. Gemini Monomers: A New Approach towards High Performance Polymeric Materials.

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CSMS participants competed in the Agriculture track at NDSU's Innovation Challenge 2017 and placed.....

October 3, 2017

Pictured (L to R): Burkart, Amiri, Helten, and Ulven

Two participants with the Center for Sustainable Materials Science (CSMS), PhD Graduate student Ali Amiri, and Master's student Victoria Burkart – along with Britt Helten, a Master's student also doing research on sustainability – presented their innovative idea 'Sustainable Sporting Goods' at this year's Innovation Challenge at NDSU and placed 2nd in the Agricultural track! All three work on research under Dr. Chad Ulven, Associate Professor in Mechanical Engineering at North Dakota State University.

Congratulations to Ali, Victoria and Britt on your winning innovative idea!

The sustainability research Dr. Ulven is working on in CSMS is what led the students to their innovative idea. Their idea had been selected, along with 43 other innovative ideas, to move on to the semi-final round of the Innovation Challenge scholarly competition that was held on January 30th, 2017 at NDSU's Memorial Union.

Since the 2017 NDSU Innovation Challenge, Britt and Ali have graduated; and Ali, now Dr. Amiri, has joined the Mechanical Engineering faculty at NDSU as an Assistant Professor of Practice. Congratulations Britt and Ali!

A little bit more about Dr. Amiri:

Ali has been working with CSMS since 2014 and has been developing bio-based composites using flax fiber and soybean oil resins developed by Dr. Dean Webster's CSMS group. What got him interested in the STEM/science field: The most interesting part about it is to find out about the science behind everything, design and create new ideas, and apply those ideas and science to everyday life with the goal of improving everyone's life including future generations (sustainable design).

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Dr. Chad Ulven and CSMS featured in NDSU News story  
October 3, 2017

Dr. Chad Ulven recently received a scientist medal from the International Association of Advanced Materials. NDSU News featured Ulven and his work with CSMS in the following news post on 9/29/2017.

Associate chair of mechanical engineering receives international award  
Read more at <https://www.ndsu.edu/news/view/detail/30731/>

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Dr. Chad Ulven and CSMS were featured at Publicnow.com  
October 3, 2017

Dr. Chad Ulven and CSMS were mentioned in the following Publicnow.com post on 9/29/2017



Associate chair of mechanical engineering receives international award

Read more at

<http://www.publicnow.com/view/A081DD25C07F6485EF7C6C3686C179B8A6019454>

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CSMS researcher Chad Ulven receives 2017 Scientist Medal from IAAM for his CSMS research  
September 15, 2017

Dr. Chad Ulven, Associate Professor of Mechanical Engineering at NDSU and CSMS researcher, recently received the 2017 Scientist Medal from the International Association of Advanced Materials (IAAM) at their annual European Advanced Materials Congress (EAMC) held August 22-24, 2017 in Stockholm, Sweden.

Ulven received the award through his CSMS collaborative work with Dr. Sivaguru, a former CSMS researcher now at Bowling Green State University, aimed at creating recyclable biocomposites from photo-triggered resins.

Congratulations to Dr. Ulven on this scientific recognition!

UPDATE 10/03/2017: Dr. Ulven's achievement was noted on 9/29/2017 in the NDSU News post Associate chair of mechanical engineering receives international award as well as on Publicnow.com

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CSMS research featured at <http://www.specialchem4bio.com/>  
March 30, 2017

CSMS research was featured at  
<http://www.specialchem4bio.com/news/2014/12/03/researchers-aim-to-develop-fructose-derived-plastic-that-degrades-when-exposed-to-uv-light> on 12/03/2014.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in Angewandte Chemie on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research featured at <http://www.chemistry2011.org/>  
March 30, 2017

CSMS research was featured at  
<http://www.chemistry2011.org/news/PhysicalChemistry/MaterialsScience/NewPlasticThatDisappearsWhenYouWantItTo> on 11/26/2014.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research featured at <http://technology.risiinfo.com/>  
March 30, 2017

CSMS research was featured at <http://technology.risiinfo.com/packaging-technology/north-america/new-plastic-breaks-down-when-exposed-light-researched-north-dakota-state-university> on 11/28/2014.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS graduate student from NDSU speaking at a Gordon Research Seminar  
March 30, 2017

Ramya Raghunathan, NDSU graduate student and CSMS research, was invited to speak at the Gordon Research Seminar July, 2015.

The news was not only released by NDSU News at <https://www.ndsu.edu/news/view/detail/20640/> on 7/14/2015 but also included that day on the NDSU Research and Creative Activity news page at <https://www.ndsu.edu/research/news/detail/20601/> and featured on the NDSU Research and Creative Activity Newsroom at [https://www.ndsu.edu/research/newsroom/feature\\_stories/ndsu\\_grad\\_student\\_invited\\_speaker\\_at\\_gordon\\_research\\_seminar/](https://www.ndsu.edu/research/newsroom/feature_stories/ndsu_grad_student_invited_speaker_at_gordon_research_seminar/)

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NDSU Research and Creative Activity Newsroom featured CSMS research  
March 30, 2017

The NDSU Research and Creative Activity's Newsroom featured the CSMS research that had been published in *Angewandte Chemie*.

You can view their post 'New Plastic That Disappears When You Want It To' from 11/24/2014 at [https://www.ndsu.edu/research/newsroom/feature\\_stories2014/new\\_plastic\\_that\\_disappears\\_when\\_you\\_want\\_it\\_to/](https://www.ndsu.edu/research/newsroom/feature_stories2014/new_plastic_that_disappears_when_you_want_it_to/)

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research featured at Ringier industrysourcing.cn

March 30, 2017

CSMS research was featured at <http://www.industrysourcing.cn/article/321841> on 11/26/2014.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research featured in blog at <http://sidmelo.blogspot.com/>

March 30, 2017

CSMS research was featured in the 2nd blog post at [http://sidmelo.blogspot.com/2014\\_11\\_26\\_archive.html](http://sidmelo.blogspot.com/2014_11_26_archive.html) on 11/26/2014.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research featured at the Korean Adhesive Coating Association site

<http://www.kacapotal.org/>

March 30, 2017

CSMS research was featured at [http://www.kacapotal.org/index.php?mid=info\\_chemi&order\\_type=desc&sort\\_index=readed\\_count&page=7&document\\_srl=9331&listStyle=viewer](http://www.kacapotal.org/index.php?mid=info_chemi&order_type=desc&sort_index=readed_count&page=7&document_srl=9331&listStyle=viewer) on 12/01/2014.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://russia.timesofnews.com/>

March 30, 2017

CSMS research was featured at <http://russia.timesofnews.com/new-plastic-that-disappears-when-you-want-it-to/> on 11/26/2014.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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News about CSMS graduate student invited to speak at Gordon Research Seminar featured at [newswise.com](http://newswise.com)

March 30, 2017

We have recently discovered that the NDSU News story run 7/14/2015 about Graduate student and CSMS researcher Ramya Raghunathan being invited to speak at a Gordon Research Seminar had been picked up by [newswise.com](http://www.newswise.com) at <http://www.newswise.com/articles/ndsu-grad-student-invited-speaker-at-gordon-research-seminar> on 7/14/2015.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research featured at <http://m.blog.daum.net/>

March 27, 2017

CSMS research was featured at the following South Korean web portal <http://m.blog.daum.net/imi7005/7671369?categoryId=471980> and was published on 12/01/2014.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research featured at <http://dreamusn.kr/>

March 27, 2017

Another mention of CSMS research has been found at [http://dreamusn.kr/Home/board/bbs/board.php?bo\\_table=IT\\_News&wr\\_id=19551&page=343](http://dreamusn.kr/Home/board/bbs/board.php?bo_table=IT_News&wr_id=19551&page=343) and was published on 11/25/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research featured at <http://news.bio-based.eu/>  
March 27, 2017

Another mention of CSMS research, just found at <http://news.bio-based.eu/north-dakota-state-develops-new-bioplastic/>, was published on 12/03/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research featured in new NSF EPSCoR informational brochure  
March 21, 2017

CSMS research was featured in a new NSF EPSCoR informational brochure at [https://www.nsf.gov/od/oia/programs/epscor/EPSCoR\\_Brochure.pdf](https://www.nsf.gov/od/oia/programs/epscor/EPSCoR_Brochure.pdf)

The brochure can also be accessed from this pdf of new NSF EPSCoR brochure

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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Broadcast about ND EPSCoR Workforce Development activities includes efforts with CSMS and CRCS researchers  
March 17, 2017

Cindy Juntunen and Ashley Hutchison, members of the ND EPSCoR Workforce Development team discussed their efforts with Doug Hamilton on Prairie Public Radio's Main Street broadcast on March 13, 2017.

Part of the conversation included their efforts with researchers in the ND EPSCoR-funded Center for Sustainable Materials Science (CSMS) and Center for Regional Climate Studies (CRCS).

You can listen to the complete broadcast at <http://www.prairiepublic.org/radio/mainstreet?post=69233>. The conversation about their work with CSMS and CRCS researchers begins at about the 8:50 mark and continues to about the 10:15 mark.

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CSMS research was featured at [www.decodedscience.org](http://www.decodedscience.org)

March 13, 2017

CSMS research was featured at <https://www.decodedscience.org/programmed-polymers-degradation-base-material-reuse/55008> on 7/16/2015

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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Jayaraman Sivaguru CSMS research featured in a story at [compositesandarchitecture.com](http://compositesandarchitecture.com)

March 10, 2017

Some research being done in CSMS by Jayaraman Sivaguru was featured in a story at <http://compositesandarchitecture.com/?p=4746> on 11/22/2016.

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Chad Ulven and Dean Webster CSMS research featured at [compositesandarchitecture.com](http://compositesandarchitecture.com)

March 10, 2017

Some research being done in CSMS by Chad Ulven and Dean Webster was the focus of a story at <http://compositesandarchitecture.com/?p=4692> on 10/25/2016.

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Adlina Paramarta featured in the News release 'NDSU doctoral graduates join leading-edge companies'

March 10, 2017

Adlina Paramarta, former CSMS graduate student researcher and recent graduate of North Dakota State University was featured in a December 2016 NDSU News story at [https://www.ndsu.edu/news/ndsu\\_app/ndsu\\_doctoral\\_graduates\\_join\\_leading\\_edge\\_companies/](https://www.ndsu.edu/news/ndsu_app/ndsu_doctoral_graduates_join_leading_edge_companies/)

Best wishes to Adlina and Teluka.

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Chad Ulven TEDx presentation "Searching for a Better Future through Sustainable Materials" includes his CSMS research

March 10, 2017

Chad Ulven presented at the TEDx event on 8/11/2016. Part of his presentation found at <https://www.youtube.com/watch?v=dclSpDWcQWM> includes his CSMS research (at about the 6:56 mark)

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The 1st International Symposium on Materials from Renewables was featured at kvrr.com  
March 10, 2017

The 1st International Symposium on Materials from Renewables was featured in a story on 7/20/2016 at <http://www.kvrr.com/news/local-news/First-International-Symposium-on-Materials-from-Renewables-Held-at-NDSU/40789804>

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1st International Symposium on Materials from Renewables featured at inforum.com  
March 10, 2017

The 1st International Symposium on Materials from Renewables was featured in a story on 7/19/2016 at <http://www.inforum.com/news/4077154-what-more-sustainable-plants-ndsu-researchers-studying-renewable-plastics>

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News release: NDSU to host first Materials for Renewables symposium  
March 10, 2017

This news release at <https://www.ndsu.edu/news/view/detail/25162/> from 07/01/2016 provides more information about the 1st International Symposium on Materials from Renewables.

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News about the 1st International Symposium on Materials from Renewables featured at highbeam.com  
March 10, 2017

The news about the 1st International Symposium on Materials from Renewables was picked up by highbeam.com on 4/25/2016 at <https://www.highbeam.com/doc/1G1-450617484.html>

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News release: NDSU to host international symposium on materials from renewables  
March 10, 2017

A collaboration that includes CSMS researchers at NDSU and the University of Georgia has led to the 1st International Symposium on Materials from Renewables.

The initial announcement for this Symposium, from 4/25/2016, can be found at <https://www.ndsu.edu/news/view/detail/24443/>

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Arvin Yu presenting CSMS poster featured at soybiobased.org  
March 10, 2017

A photo of Arvin Yu presenting his CSMS poster July 2015 at the ACS Green Chemistry and Engineering Conference is featured at <http://www.soybiobased.org/CBN/>

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Arvin Yu, NDSU graduate student and CSMS researcher, featured in a story at soybiobased.org March 10, 2017

Arvin's CSMS research on biobased thermosets was featured in a story at <http://www.soybiobased.org/CBN/north-dakota-state-students-test-soy-resins-for-3-d-printing>.

A photo accompanies the story showing Arvin with his CSMS poster at the 2015 ACS Green Chemistry and Engineering Conference.

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CSMS research was featured at <http://thegreenenergyblog.com> March 10, 2017

CSMS research was featured at <http://thegreenenergyblog.com/uncategorized/newly-invented-plastic-from-biomass-degrades-after-use> on 12/08/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in Angewandte Chemie on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.plasticsnewseurope.com> (previously posted on prw.com)

March 10, 2017

CSMS research was featured at

<http://www.plasticsnewseurope.com/article/20141202/PNE/312029981/bioplastic-made-from-fructose-degrades-in-uv-light> on 12/02/2014.

NOTE: A link was previously posted under

<http://www.prw.com/subscriber/headlines2.html?cat=0&id=6073> but prw.com now forwards to Plastics News Europe.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in Angewandte Chemie on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.spectroscopynow.com>

March 10, 2017



CSMS research was featured at  
<http://www.spectroscopynow.com/details/ezone/149f0ba94aa/Plastic-fantastic-UV-recycling.html?tzcheck=1> on 12/01/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.manufacturingmirror.com>  
March 10, 2017

CSMS research was featured at <http://www.manufacturingmirror.com/index.php/sid/228109265>  
on 12/01/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at Korean Advanced Institutes of Convergence Technology blog  
March 10, 2017

CSMS research was featured at  
<http://blog.naver.com/PostView.nhn?blogId=jopd64&logNo=220197317627> on 12/01/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://kfgo.com>  
March 10, 2017

CSMS research was featured at <http://kfgo.com/news/articles/2014/dec/01/researchers-testing-plastics-made-from-crops/> on 12/01/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.recyclinginternational.com>

March 10, 2017

CSMS research was featured at <http://www.recyclinginternational.com/recycling-news/8359/research-and-legislation/united-states/light-triggers-plastics-rebirth> on 12/01/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.plastemart.com>

March 10, 2017

CSMS research was featured at <http://www.plastemart.com/news-plastics-information/New-Plastic-that-disappears/26336> on 12/01/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.mitchellrepublic.com>

March 10, 2017

CSMS research was featured at <http://www.mitchellrepublic.com/content/researchers-testing-plastics-made-crops> on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.jamaicantimes.com>

March 10, 2017

CSMS research was featured at <http://www.jamaicantimes.com/index.php/sid/228024417> on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://ruski.biz>  
March 10, 2017

CSMS research was featured at <http://ruski.biz/2014/11/26/scientists-invent-new-plastic-from-biomass-degrading-after-use/> on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.saltlakecitynews.net>  
March 10, 2017

CSMS research was featured at <http://www.saltlakecitynews.net/article/228109265/researchers-testing-plastics-made-from-crops> on 12/1/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at [texarkanagazette.com](http://texarkanagazette.com)  
March 10, 2017

CSMS research was featured at <https://www.pressreader.com/usa/texarkana-gazette/20141201/281891591595254> on 12/1/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.agweb.com>  
March 10, 2017

CSMS research was featured at <http://www.agweb.com/article/researchers-experiment-with-plastics-made-from-crops-associated-press/> (their post date unknown)

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in Angewandte Chemie on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at SPE at <http://multibriefs.com/briefs/spe/SPE120314.php>  
March 10, 2017

CSMS research was featured at <http://multibriefs.com/briefs/spe/SPE120314.php> (their post date unknown)

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in Angewandte Chemie on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.deseretnews.com>  
March 10, 2017

CSMS research was featured at <http://www.deseretnews.com/article/765663511/Researchers-testing-plastics-made-from-crops.html> on 11/30/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in Angewandte Chemie on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://ethanol.einnews.com>  
March 10, 2017

CSMS research was featured at  
[http://ethanol.einnews.com/article\\_\\_detail/237254566?lcode=M0-X4qim\\_yNJhb2tVgF7eA%3D%3D](http://ethanol.einnews.com/article__detail/237254566?lcode=M0-X4qim_yNJhb2tVgF7eA%3D%3D) on 11/30/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in Angewandte Chemie on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://newsok.com>  
March 10, 2017

CSMS research was featured at <http://newsok.com/researchers-testing-plastics-made-from-crops/article/feed/766286> on 11/30/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.washingtontimes.com>

March 10, 2017

CSMS research was featured at

<http://www.washingtontimes.com/news/2014/nov/30/researchers-testing-plastics-made-from-crops/> on 11/30/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.wopular.com>

March 10, 2017

CSMS research was featured at <http://www.wopular.com/researchers-testing-plastics-made-crops> on 11/30/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://rapidcityjournal.com>

March 10, 2017

CSMS research was featured at [http://rapidcityjournal.com/news/latest/researchers-testing-plastics-made-from-crops/article\\_95110a09-9911-5a51-94e7-1a6605ebfcbe.html](http://rapidcityjournal.com/news/latest/researchers-testing-plastics-made-from-crops/article_95110a09-9911-5a51-94e7-1a6605ebfcbe.html) on 11/30/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://lancaster144.rssing.com>

March 10, 2017

CSMS research was featured at [http://lancaster144.rssing.com/chan-13860403/all\\_p323.html](http://lancaster144.rssing.com/chan-13860403/all_p323.html)  
on 11/29/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.grandforksherald.com>

March 10, 2017

CSMS research was featured at <http://www.grandforksherald.com/content/ndsu-chemists-testing-new-plastic-could-help-north-dakotas-economic-stability> on 11/28/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.maritime-executive.com>

March 10, 2017

CSMS research was featured at <http://www.maritime-executive.com/article/Light>Returns-New-Plastic-to-Atoms-2014-11-28> on 11/28/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.business-standard.com> News-ANS

March 10, 2017

CSMS research was featured at [http://www.business-standard.com/article/news-ians/a-plastic-that-breaks-down-on-demand-114112700419\\_1.html](http://www.business-standard.com/article/news-ians/a-plastic-that-breaks-down-on-demand-114112700419_1.html) on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.business-standard.com> pti-stories  
March 10, 2017

CSMS research was featured at [http://www.business-standard.com/article/pti-stories/new-plastic-breaks-down-on-demand-114112700662\\_1.html](http://www.business-standard.com/article/pti-stories/new-plastic-breaks-down-on-demand-114112700662_1.html) on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://zeenews.india.com>  
March 10, 2017

CSMS research was featured at [http://zeenews.india.com/news/sci-tech/a-plastic-that-breaks-down-on-demand\\_1505662.html](http://zeenews.india.com/news/sci-tech/a-plastic-that-breaks-down-on-demand_1505662.html) on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.financialexpress.com>  
March 10, 2017

CSMS research was featured at <http://www.financialexpress.com/lifestyle/science/indian-origin-researchers-develop-new-plastic-that-breaks-down-on-demand/13375/> on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.india-forums.com>  
March 10, 2017

CSMS research was featured at <http://www.india-forums.com/news/america/625857-a-plastic-that-breaks-down-on-demand.htm> on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.inforum.com>

March 10, 2017

CSMS research was featured at <http://www.inforum.com/content/ndsu-chemists-testing-new-renewable-biomass-plastic> on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://investmentwatchblog.com>

March 10, 2017

CSMS research was featured at <http://investmentwatchblog.com/is-green-plastic-the-real-deal-scientists-say-yes-it-will-be-degradable-made-of-biomass/> on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <https://lucas2012infos.wordpress.com>

March 10, 2017

CSMS research was featured at <https://lucas2012infos.wordpress.com/2014/11/27/newly-invented-plastic-from-biomass-degrades-after-use-27-november-2014/> on 11/27/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.azom.com>

March 10, 2017



CSMS research was featured at <http://www.azom.com/news.aspx?newsID=42904> on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://m.eetindia.co.in>

March 10, 2017

CSMS research was featured at

[http://m.eetindia.co.in/ART\\_8800707100\\_1800007\\_NT\\_03d91f29\\_2.HTM#.VIIsGlvU49o](http://m.eetindia.co.in/ART_8800707100_1800007_NT_03d91f29_2.HTM#.VIIsGlvU49o) on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://theenergysource.org>

March 10, 2017

CSMS research was featured at <http://theenergysource.org/143423-newly-invented-plastic-from-biomass-degrades-after-use-rt> on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.foodpackagingforum.org>

March 10, 2017

CSMS research was featured at <http://www.foodpackagingforum.org/news/novel-photodegradable-bioplastics> on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.greenstyle.it>

March 10, 2017

CSMS research was featured at <http://www.greenstyle.it/plastica-in-arrivo-nuovo-materiale-che-si-degrada-al-sole-124375.html> on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.houstonmirror.com>

March 10, 2017

CSMS research was featured at <http://www.houstonmirror.com/index.php/sid/227983681> on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.plasticexpert.co.uk>

March 10, 2017

CSMS research was featured at <http://www.plasticexpert.co.uk/biomass-plastic-recycling/> on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://rt.com>

March 10, 2017

CSMS research was featured at <http://rt.com/news/209139-new-plastic-biomass-degrades/> on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <https://worldindustrialreporter.com>  
March 10, 2017

CSMS research was featured at <https://worldindustrialreporter.com/ndsu-develops-new-type-plastic-can-broken-made-new/> on 11/26/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.greenhero.com>  
March 10, 2017

CSMS research was featured at  
[http://www.greenhero.com/index.php?route=extras/blog/getblog&blog\\_id=305](http://www.greenhero.com/index.php?route=extras/blog/getblog&blog_id=305) on 11/21/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.iflscience.com>  
March 10, 2017

CSMS research was featured at <http://www.iflscience.com/technology/new-plastic-degrades-just-three-hours> on 11/20/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://telezkope.com>  
March 10, 2017

CSMS research was featured at <http://telezkope.com/Science/Chemistry/3785401/ultimate-recycling-new-plastic-that-disappears-when-you-want-it-to> November 2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://telezkope.com>  
March 10, 2017

CSMS research was featured at <http://telezkope.com/Science/Chemistry/3785401/ultimate-recycling-new-plastic-that-disappears-when-you-want-it-to> November 2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <https://www.materialist.com>  
March 9, 2017

CSMS research was featured at <https://www.materialist.com/disappearing-plastic/> (their post date unknown)

Note: This link was previously added on 10/14/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://advancedbiofuelsusa.info>  
March 9, 2017

CSMS research was featured at <http://advancedbiofuelsusa.info/ndsu-new-plastic-disappears-when-you-want-it-to/> on 12/15/2014

Note: This link was previously added on 10/14/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.greenoptimistic.com>  
March 9, 2017

CSMS research was featured at [http://www.greenoptimistic.com/bio-plastics-made-fructose-disappear-please-20141202/#.V\\_\\_2MsmMtVI](http://www.greenoptimistic.com/bio-plastics-made-fructose-disappear-please-20141202/#.V__2MsmMtVI) on 12/02/2014

Note: This link was previously added on 10/14/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.ibtimes.co.uk>  
March 9, 2017

CSMS research was featured at <http://www.ibtimes.co.uk/plastic-made-biomass-degrade-back-original-molecules-after-use-1476659> on 11/27/2014

Note: This link was previously added on 10/14/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

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The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.unknowncountry.com>  
March 9, 2017

CSMS research was featured at <http://www.unknowncountry.com/news/scientists-create-new-disappearing-plastic-while-our-plastic-waste-mysteriously-disappearing> on 11/26/2014

Note: This link was previously added on 10/14/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.industrytap.com>  
March 9, 2017

CSMS research was featured at <http://www.industrytap.com/scientists-create-new-plastic-disappears-ultraviolet-light/25312> on 12/19/2014

Note: This link was previously added on 7/29/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.chinatopix.com>  
March 9, 2017

CSMS research was featured at <http://www.chinatopix.com/articles/25374/20141201/new-plastic-created-disappears-when-exposed-specific-light.htm> on 12/01/2014

Note: This link was previously added on 7/29/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

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The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://solutiongeneration.org>  
March 9, 2017

CSMS research was featured at <http://solutiongeneration.org/blog/north-dakota-state-university-researchers-may-make-plastic-disappear> on 11/26/2014

Note: This link was previously added on 7/29/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

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The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.sciencealert.com>  
March 9, 2017

CSMS research was featured at <http://www.sciencealert.com/researchers-have-developed-plastics-that-break-down-in-just-three-hours> on 11/20/2014

Note: This link was previously added on 7/29/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.sciencemag.org>  
March 9, 2017

CSMS research was featured at <http://www.sciencemag.org/news/2014/11/plastic-recycles-itself> on 11/19/2014

Note: This link was previously added on 7/29/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <https://www.innovationtoronto.com>

March 9, 2017

CSMS research was featured at <https://www.innovationtoronto.com/2014/11/new-plastic-that-disappears-when-you-want-it-to/> November 2014

Note: This link was previously added on 7/29/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.epscorideafoundation.org>

March 9, 2017

CSMS research was featured at <http://www.epscorideafoundation.org/successes/center-for-sustainable-science-develops-proof-of-concept-for-new-type-of-plastic> (their post date unknown)

Note: This link was previously added on 7/29/16 to our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.newswise.com>

March 9, 2017

CSMS research was featured at <http://www.newswise.com/articles/new-plastic-that-disappears-when-you-want-it-to> on 11/24/2014

Note: This link was previously posted with our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>



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CSMS research was featured at <https://www.sciencedaily.com>

March 9, 2017

CSMS research was featured at

<https://www.sciencedaily.com/releases/2014/11/141125101741.htm> on 11/25/2014

Note: This link was previously posted with our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://greenarea.me>

March 9, 2017

CSMS research was featured at <http://greenarea.me/en/63322/new-plastic-that-disappears-when-you-want-it-to/> on 11/26/2014

Note: This link was previously posted with our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

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The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://phys.org>

March 9, 2017

CSMS research was featured at <http://phys.org/news/2014-11-ultimate-recycling-plastic.html> on 11/26/2014

Note: This link was previously posted with our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.plasticsouplab.org>  
March 9, 2017

CSMS research was featured at <http://www.plasticsouplab.org/new-plastic-that-disappears-when-you-want-it-to/> on 11/26/2014

Note: This link was previously posted with our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in *Angewandte Chemie* on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.scienceworldreport.com>  
March 9, 2017

CSMS research was featured at <http://www.scienceworldreport.com/articles/19346/20141127/new-plastic-disappears-ultraviolet-light.htm> on 11/27/2014

Note: This link was previously posted with our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

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The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at <http://www.biomassmagazine.com>  
March 9, 2017

CSMS research was featured at <http://www.biomassmagazine.com/articles/11260/ndsu-new-plastic-disappears-when-you-want-it-to> on 11/28/2014

Note: This link was previously posted with our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added March 2017 to our Media Outlet category of our news page.

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in Angewandte Chemie on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

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News release: New Plastic That Disappears When You Want It To  
March 9, 2017

The news release found at <https://www.ndsu.edu/research/news/detail/16161/> announces research done by CSMS researchers was published in Angewandte Chemie on 11/12/2014.

The journal article titled 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' can be read at <http://dx.doi.org/10.1002/anie.201408492>

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CSMS research was featured at [xpo.castsheet.com](http://xpo.castsheet.com)  
February 27, 2017

CSMS research was featured at <http://xpo.castsheet.com/new-plastic-disappears-want/> on 12/1/2014

The news feature is related to the journal article 'Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources' published in Angewandte Chemie on 11/12/2014.

The journal article can be read at <http://dx.doi.org/10.1002/anie.201408492>

Note: This link was previously posted with our blog post from 10/5/2015 titled 'Proof-of-concept developed for new type of degradable biomass plastic!' but has been added February 2017 to our Media Outlet category of our news page.

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High School Chemistry teacher sparked scientific curiosity  
February 16, 2017

Arvin Yu, a Graduate Student in Coatings and Polymeric Materials at North Dakota State University, assists in the Center for Sustainable Materials Science (CSMS) research in Dr. Dean Webster's CSMS research group. Arvin's contribution to CSMS research is in developing bio-based resins from soybean oil and sugar for structural composite applications. Arvin wants to work in the industry and put into practice the knowledge and skills he learned through his work with the CSMS research group.

Arvin has been scientifically inclined since he was young. His high school chemistry teacher sparked scientific curiosity in him at an early age, and she influenced him to take an active interest in chemistry. Fun fact about Arvin: he finds it fun and enjoyable to try out different cuisines when he goes out to eat.

You can watch Arvin, alongside graduate student Adlina Paramarta and Postdoc Ivan Hevus, in the following video as they talk about some of their work with the CSMS research group:  
<https://vimeo.com/181097192>

You can also see Arvin featured in the following local KVLV news segment, with fellow graduate student Kyle Kingsley, about their experiments at the NDSU graduate-run event Avenues of Scientific Discovery <https://www.youtube.com/watch?v=LveE1Sr0O5c&feature=youtu.be>

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Science Training in Advanced Interdisciplinary Research in Sustainable Chemistry (STAIRS @ Sivagroup) at North Dakota State University  
February 3, 2017  
By Dr. Jayaraman Sivaguru, Ramya Raghunathan and Ravichandranath Singathi

In June 2016, Dr. Jayaraman Sivaguru's Center for Sustainable Materials Science (CSMS) research group, through a research collaborative partnership with Dr. Mafany Mongoh at Sitting Bull College (SBC), Fort Yates, ND, welcomed Mr. Saul Bobtail Bear and Mr. Josh Silk to Dr. Sivaguru's lab at NDSU. Saul and Josh are environmental science students at Sitting Bull College participating in CSMS research under Dr. Mafany Mongoh. As part of the ND EPSCoR program, the Center for Sustainable Materials Science (CSMS) plays an important role for research collaborative projects among different research expertises in science and engineering. CSMS helps in providing research and STEM education opportunities for students across the state, including students at the Tribal Colleges (TCs). CSMS research groups across the state teach and explain the importance of using agricultural materials to develop sustainable materials as alternative energy resources for fossil fuel materials.

Dr. Sivaguru's CSMS group provided research training for Saul and Josh using his interdisciplinary training program STAIRS @ Sivagroup. The STAIRS @ Sivagroup training program helps students meet the challenges of the 21st century through integration of science, technology and research with outreach and collaboration. Saul and Josh worked on the synthesis of photodegradable polymers derived from biomass (fructose-derived products) by incorporating phototriggers as a light sensitive unit in the polymer backbone. CSMS students Ramya Raghunathan and Ravichandranath Singathi interacted closely and worked in collaboration with Saul and Josh.

Apart from the synthesis, they did controlled degradation of the biobased polymer and the model systems by employing light as the energy source for the recovery of the monomer. The techniques they learned included experiment/reaction setup, isolation of compounds by

extractions and purification, photoreactions in a Rayonet Photoreactor/chamber, and analysis of the products formed by TLC and NMR characterizations.

At the end of the training, Josh mentioned that “it’s a nice platform and a good start for undergraduate students from different fields like engineering, microbiology, environmental sciences to get familiarize about the importance of sustainable materials in day to day life and understanding about the impact of fossil fuels derived products and their depletion from the environment”. The STAIRS @ Sivagroup interdisciplinary learning program motivates students from diverse backgrounds and helps students working in CSMS research teams to understand, and help others understand, the true meaning of sustainability, renewability, and reproducibility.

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Interest in Sciences comes from family and high school chemistry teachers

January 30, 2017

The Center for Sustainable Materials Science (CSMS), funded by a National Science Foundation EPSCoR grant, provides opportunities for graduate and undergraduate students to engage in research. One of these students is Eric Serum, a doctoral graduate student majoring in Synthetic Organic Chemistry at North Dakota State University, who has worked alongside several undergraduates in Dr. Mukund Sibi’s CSMS research group to devise and develop optimal strategies for the synthesis, purification, and characterization of 2,5-bis(hydroxymethyl)furan, 5-hydroxymethylfurfural, 2,5-diformylfuran, 2,5-furandicarboxylic acid, 3,3'-fur-2,5-diylbis(acrylic acid) and their derivatives.

Eric SerumEric’s central research theme focuses on the application of the Diels-Alder reaction to those biomass derived furans for the preparation of novel C1,C4-disubstituted-7-oxabenzonorbornadienes, which have been aromatized in our work to prepare naphthalenic terephthalic acid analogs. He intends to complete his doctoral thesis in 2018, secure an avenue for continued intellectual and professional development (either a program for academic or industrial post-doctoral study), or find work in the chemical industries, before ultimately returning to academia if there is an opportunity.

Eric’s initial interest in sciences comes from his family. “My mother initially got me going with dinosaurs. From a young age, I was particularly interested in paleontology which developed into a passion for life sciences and for astrophysics/planetology. In high school I had two wonderful chemistry teachers (one for general chemistry and one for organic chemistry); it also turns out that most astronomers spend time looking at computer screens rather than the night sky nowadays. Those two factors controlled my decision to pursue an undergraduate degree in chemistry at the University of Wisconsin – River Falls where I had the great pleasure of working for a research advisor who gave me every opportunity to develop technical skills and fundamental knowledge. The small class sizes at UWRF afforded many opportunities to interact with each of the faculty members directly so that I was always able to challenge my understanding.”

Eric is one of several students featured in the following video about some of the work being done in Dr. Mukund Sibi’s CSMS research group: <https://vimeo.com/164640773>. This video and others from the CSMS researchers can be found on the CSMS website’s Multimedia page at <http://csms-ndsu.org/multimedia/>.

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NATURE camp students shine light at Dr. Jayaraman Sivaguru's lab

December 15, 2016

By Dr. Jayaraman Sivaguru, Ramya Raghunathan and Ravichandranath Singathi

Dr. Jayaraman Sivaguru and his Center for Sustainable Materials Science (CSMS) team hosted NATURE Summer Camp students during the Summer of 2016 and provided them with hands-on experience in scientific research. The NATURE (Nurturing American Tribal Undergraduate Research and Education) program, funded by ND-EPSCoR, was initiated to promote and encourage Native American students to step into a STEM career.

This summer, two high school students, Heather One Horn and Sasha Azure from Solen High School, ND, chose to work with graduate students Ravichandranath Singathi from Dr. Sivaguru's CSMS research group and Ramya Raghunathan from Dr. Sivaguru's and Dr. Mukund Sibi's CSMS research groups, to get in depth knowledge about biomass derived polymers and their degradation using light. Heather and Sasha are two of eight high school students who traveled to the NATURE camp from the Standing Rock Indian Reservation with Dr. Mafany Mongoh, NATURE coordinator from Sitting Bull College.

275545981

During their time in the lab, Heather and Sasha researched the breaking down of polymers by using one of the abundant and greener reagents "Light". This research has the potential to be developed into materials that can be degraded in an environmentally friendly and sustainable way. The materials they chose to work with are hydroxy acetophenone, a phototrigger, and methacrylic acid, a monomer. A phototrigger is a light sensitive unit, which is incorporated during the polymerization process with the monomer. Light can then break the polymer down to give the monomer back, making the material recyclable.

Apart from synthesizing the polymer and degrading it, Heather and Sasha also learned the theory behind techniques such as thin layer chromatography (TLC), using a Rayonet reactor, nuclear magnetic resonance (NMR), and rotatory evaporator, all of which they used to analyze their experimental results.

By the end of their 4-day research experience, the students had learned new techniques and gained scientific insights, which they shared with other NATURE camp students in a PowerPoint presentation at the NATURE camp's closing ceremony.

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Chad Ulven awarded Walter F. and Verna Gehrts Presidential Professorship

December 6, 2016

272777463 Congratulations to Chad Ulven, Associate Professor of Mechanical Engineering at NDSU,

and researcher in the Center for Sustainable Materials Science, for receiving the Walter F. and Verna Gehrts Presidential Professorship.

The Walter F. and Verna Gehrts Presidential Professorship is awarded to an Associate Professor with at least 5 years of service to NDSU who demonstrates excellence in teaching, research, and service.

Chad earned a doctorate and a master's degree from the University of Alabama at Birmingham and a bachelor's degree from NDSU.

Chad joined the faculty at NDSU in 2005. His previous honors and awards includes the NDSU College of Engineering & Architecture 2007-2008 Faculty Researcher of the Year Award.

More information about this year's endowed professorships at NDSU can be found at

<https://www.ndsu.edu/news/view/detail/27108/>

To read more about Chad Ulven, visit his faculty page at

<https://www.ndsu.edu/me/faculty/ulven.php>

Two NATURE Camp students participate in NATURE+ research with NDSU CSMS researcher Dr. Mukund Sibi  
August 18, 2016  
By Catherine Sutton

NatureCamp-2 This summer at NDSU from June 13-16, the Dr. Mukund Sibi-CSMS team became involved in the NATURE program. The NATURE program, funded by the ND EPSCoR program, is in place to promote the experiences of Native American Students in STEM careers.

As enthusiastic college students, Connie and Kimberlee were a part of the NATURE+ program which afforded them a more in depth experience into a STEM field of their choosing. In this case, the students chose to learn about Biomass-derived chemistry with graduate students Eric Serum and Catherine Sutton from Dr. Mukund Sibi's CSMS research group.

The biomass of choice out of the three available for Connie and Kimberlee's mini-projects was cellulose, more specifically fructose from which the foundational compound 5-hydroxymethylfurfural is derived. HMF is the basis for the starting materials used in the reactions run by Kimberlee and Connie, facilitated by the graduate students. The goal product for Kimberlee's reaction was the formation of 2,5 diformylfuran while Connie's was a dimethylnaphthalene.

#### NATURE Image

Connie and Kimberlee learned about the process of running a reaction and analyzing the products of such a reaction by:

Gathering materials

Reacting the materials under specific conditions

And analyzing the products

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Welcome Quintin Elliott and Breanne Hatfield

August 17, 2016

By Kathy Wahlberg

REU Welcome Research Experience for Undergraduates award recipients Quintin Elliott and Breanne Hatfield to CSMS.

Quintin Elliott and Breanne Hatfield are two of five undergraduate students who have received awards in the Research Experience for Undergraduates (REU) Pilot Program of the North Dakota Experimental Program to Stimulate Competitive Research, known as ND EPSCoR.

Through the award, students will learn scientific research and communication skills as they work with faculty on cutting-edge research projects in chemistry, materials science, engineering, agribusiness and applied economics, hydrology and atmospheric sciences. Their research projects will consist of 200 hours conducted for up to one year, beginning June 1. Recipients are awarded a \$5,000 stipend and up to \$2,000 for summer housing.

The REU program is primarily geared toward undergraduate students in the STEM disciplines and provides the opportunity to work in the Center for Regional Climate Studies (CRCS) or the Center for Sustainable Materials Science (CSMS). Students must be enrolled at North Dakota State University, University of North Dakota, one of the five tribal colleges located in North Dakota, or one of four North Dakota University System primarily undergraduate institutions.

Student recipients, their institutions, Center of Research, and advisors are:

Levi Bassett, Dickinson State University, CRCS, Joshua Steffan

Quintin Elliott, University of North Dakota, CSMS, Qianli Chu

Breanne Hatfield, Minot State University, CSMS, Mikhail Bobylev

Billi Petermann, Dickinson State University, CRCS, Eric Brevik

Hayden Zander, Valley City State University, CRCS, Andre DeLorme

North Dakota EPSCoR is a federally and state funded program designed to improve the ability of university and college researchers to compete more effectively for federal, regional and private research grants in the sciences, technology, engineering and mathematics.

News about these awards were announced on the following website pages:

Dickinson State

NDSU

UND

Valley City State

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Future Dentist's Progression through Employment in an Organic Chemistry Laboratory

August 10, 2016



By Caitlin Bussard

Caitlin BussardI recently graduated with a major in biology and a minor in chemistry at North Dakota State University (NDSU). During my undergraduate studies, I was gifted the opportunity to work in a green chemistry laboratory under the direction of Dr. Mukund Sibi. My primary task encompassed synthesizing bio-based monomers that maintain high functional properties useful for polymer synthesis: 5-Hydroxymethylfurfural (HMF), 2,5-Diformylfuran (DFF), 5-Chloromethylfurfural (CMF), 3,3'-(2,5-furyl)bis (acrylic acid), 3,3'-(2,5-furandiyl)bis (ethyl acrylate), 3,3'-(2,5-furandiyl)bis (methyl acrylate), 3,3'-(2,5-furandiyl)bis(isopropyl acrylate), 5-(Ethoxymethyl)-2-furaldehyde, and 5,5'(oxy-bis(methylene)bis-2-furfural (OBMF). These molecules are imperative to the scientific community as they may play a role in the synthesis of sustainable fossil fuel alternatives.

equations

I stepped into the laboratory as a novice, maintaining a limited understanding of organic chemistry: processes, reactions, molecular structures, etc. As time progressed, I found myself surpassing fundamental memorization and delving into conceptual understanding. A conceptual understanding of organic chemistry became imperative as I communicated scientific findings of complex processes to diverse audiences. The ability of one to execute precise communication is a key component of my chosen career path, dentistry; I will use communicative abilities to better connect with patients, staff, and other dental professionals. Aside from communication, abilities such as organization and attention to detail have largely progressed. A great thanks to the NDSU Department of Chemistry, Dr. Mukund Sibi, Eric Serum, and Catherine Sutton for providing an environment conducive to learning and one that has impacted my professional career.

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Dean Webster, CSMS faculty research, named ACS fellow  
July 28, 2016  
Dr. Dean Webster

The American Chemical Society has named Dean C. Webster, professor and chair of coatings and polymeric materials, to the 2016 class of ACS fellows.

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CSMS students participate in poster session at the North Dakota EPSCoR 2016 State Conference  
June 11, 2016

The ND EPSCoR state conference, this year hosted by the ND EPSCoR office at the University of North Dakota (UND), was held on April 19th, 2016 at the Alerus Center in Grand Forks, ND. The conference included a Poster Session to showcase the research of students and Postdoctoral researchers in STEM fields (Science, Technology, Engineering and Mathematics).

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Research article co-authored by CSMS researchers recently published in *Macromolecules* is also featured on its cover

June 11, 2016

By Kathy Wahlberg

Congratulations to Songqi Ma, Dean C. Webster, and Farukh Jabeen from North Dakota State University (NDSU) whose research article "Hard and Flexible, Degradable Thermosets from Renewable Bioresources with the Assistance of Water and Ethanol" recently published in *Macromolecules* is also featured on its cover.

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#### CSMS RESEARCHERS IN THE NEWS

April 13, 2016

Kyle Kingsley and Arvin Yu Six graduate student researchers, two Postdoctoral researchers, and one Undergraduate student in the CSMS research group recently performed experiments related to polymers and coatings for area high school students attending the 2016 Avenues of Scientific Discovery held at the NDSU campus on April 7th, 2016.

Local television news channel KVLV had live morning news remote broadcasts from NDSU that featured CSMS research graduate students Kyle Kingsley and Arvin Yu.

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#### Sustainability Research Finds a Home at NDSU

March 3, 2016

Sustainable materials research being done by North Dakota State University professors Dr. Mukund Sibi and Dr. Dean Webster was featured in *The Spectrum*, NDSU's student-run newspaper.

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Chad Ulven to speak at the 2016 Commodity Classic about a biodegradable soil-based sensor  
January 28, 2016

Chad Ulven Chad Ulven, North Dakota State University Associate Professor in Mechanical Engineering, will speak at the 2016 Commodity Classic about a biodegradable soil-based sensor he helped to develop that, once placed throughout a crop, provides wireless, real-time information about nutrients, salinity levels, or soil temperature and moisture.

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NDSU chemistry professor Jayaraman Sivaguru, a member of the CSMS research group, receives funding to study sustainable chemistry

January 6, 2016

Jayaraman Sivaguru, North Dakota State University James A. Meier Jr. Professor of chemistry and biochemistry, has received a three-year, \$440,000 award (CHE-1465075) from the National Science Foundation to develop environmentally benign, green strategies for performing chemical reactions with light. These projects are significant in the Department's research focus area in sustainability and materials chemistry.

Read More at <http://stuffoflife.areavoices.com/2015/08/06/ndsu-chemistry-faculty-receives-funding-to-study-sustainable-chemistry/>

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Dr. Mukund Sibi recognized for research impact

December 28, 2015

NDSU Provost Beth Ingram recently recognized two University Distinguished Professors for the high impact of their research. Mukund Sibi, University Distinguished Professor of chemistry and biochemistry and James A. Meier Professor, and Lawrence Reynolds, University Distinguished Professor of animal sciences, were acknowledged for achieving an h-index in excess of 50.

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Stuff of Life Blog Article: The Synthesis of Diols Through the Use of Renewable Resources

December 10, 2015

By Joshua Santiana

My name is Joshua Santiana and I am a rising senior at the University of New Haven in West Haven, CT. There, I am double majoring in Chemistry and Forensic Science. I am also from a suburban town in Connecticut. Now, seeing as how I both grew up and attend undergraduate school in Connecticut, you might be thinking, “how in the world did you end up in North Dakota for the summer?” Well, there is a simple answer to that question. When applying for summer REU programs my main focus was trying to find a research area that I would excel at and be interested in. This is what led me to joining the Sibi Group for the summer here at North Dakota State University.

Read more

\* This item is from September 16, 2013 from the Chemistry Department’s ‘The Stuff of Life’ blog at <http://stuffoflife.areavoices.com/> and relates to CSMS activities under the previous CSMS funding.

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Read more

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Stuff of Life Blog Article: Research on the Prairie – Renewable and Resourceful 5-Hydroxymethylfurfural  
December 10, 2015  
By Jasmine Burch

My name is Jasmine Burch, and I'm a rising junior Chemistry major at Virginia State University in Petersburg, VA. I'm experiencing my first research here in the Chemistry Department at North Dakota State University. I'm pleased to have worked with The Sibi Group Lab in the Synthetic Organic Chemistry field.

Read more

\* This item is from August 2, 2012 from the Chemistry Department's 'The Stuff of Life' blog at <http://stuffoflife.areavoices.com/> and relates to CSMS activities under the previous CSMS funding.

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Stuff of Life Blog Article: Research on the Prairie – Plastic from Plants  
December 10, 2015  
By Charles Good

Elementary school was a great time in my life. I walked the four blocks from our home in south central Pennsylvania to Lititz Elementary School with my mom and our yellow lab, Elsa. I played kickball and Four Square during recess. I performed in our school play. Through this blur of young excitement, learning and building, I remember a few key moments. One of them was my introduction to good storytelling. I was in second grade, and my teacher, Mrs. Sitler, invited Mrs. Clarke (mother to one of my classmates) to perform for the class. While I don't remember any of the stories she told, I remember the way she told them. Her voice had a distinctly deep timbre and her hands danced as she told us her stories. She came to our class for one year; the next year, there was no time for telling stories as the mountains of science, history, math, and language began piling up.

Read more

\* This blog item is from August 1, 2014 from the Chemistry Department's 'The Stuff of Life' page <http://stuffoflife.areavoices.com/> and relates to CSMS activities under the previous CSMS funding.

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Center for Sustainable Materials Science (CSMS) undergraduate student's research poster places in the annual NDSU EXPLORE event

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Center for Sustainable Materials Science (CSMS) develops novel plastics from bio-based starting materials through solvent-free photoreaction in sunlight

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CSMS collaborating with ND EPSCoR NATURE Sunday Academy Program. NATURE program recently featured in the ND Department of Public Instruction's STEAM newsletter November 9, 2015

NATURECoverThe Center for Sustainable Materials Science has collaborated with the North Dakota EPSCoR Sunday Academy program to present two lessons related to their research during the 2015-2016 Sunday Academy. The Sunday Academy program, part of North Dakota EPSCoR's NATURE programming (Nurturing American Tribal Undergraduate Research and Education), is coordinated by Chad Ulven, Associate Professor in the Mechanical Engineering department at North Dakota State University.

The Sunday Academy program is designed to generate interest in math, science and engineering among American Indian high school students in North Dakota. Once a month during the academic year, high school students from the four Indian Reservations in North Dakota are brought together on a Sunday at their local tribal college in North Dakota and are presented with practical day-to-day problems involving simple math, physics, chemistry and engineering in an informal and friendly atmosphere requiring them to think, analyze and seek solutions.

For the 2015-2016 school year, seven lessons have been planned that will be taught on a Sunday between September and March. One of the lessons related to the Center for Sustainable Materials Science research is 'Purification of Water with Biobased Materials' led by Jayaraman Sivaguru and Long Jiang both from North Dakota State University. Chad Ulven also helped with the planning of this lesson. The other lesson is 'Engineered Composite Building Products' led by Dilpreet Bajwa from North Dakota State University. Other lessons will be led by other faculty from North Dakota State University as well as faculty from the tribal colleges and the University of North Dakota.

An article regarding North Dakota EPSCoR's NATURE program has recently been published in the North Dakota Department of Public Instruction's Aug/Sept issue of their STEAM newsletter. To read the article, please see pages 19-20 here . You can also visit the North Dakota EPSCoR NATURE website for more information about the NATURE program.

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News release: NDSU grad student invited speaker at Gordon Research Seminar  
October 22, 2015

RamyaPhotoRamya Raghunathan, one of North Dakota State University's doctoral graduate students involved in the Center for Sustainable Materials Science research, was invited to speak at the prestigious Gordon Research Seminar on Photochemistry that was held July 18-

19, 2015 at Stonehill College, Easton, Massachusetts. Her presentation, 'A Sustainable Approach: Employing Light for the Degradation of Polymer/Oligomer Derived from Renewable Resources', is based on research she and others involved with the Center for Sustainable Materials Science are conducting on biomass materials that are degradable with light. More information from the NDSU News release about Ramya's presentation at can be found here.

A journal article about the center's research on degradable biomass materials was published last year in Angewandte Chemie and received global attention. An announcement about this journal article can be found at NDSU News here.

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Proof-of-concept developed for new type of degradable biomass plastic!

October 5, 2015

Highlight2015CSMSPlastic

The journal article "Programmed Photodegradation of Polymeric/Oligomeric Materials Derived from Renewable Bioresources" published in January 2015 (available online 11/12/2014) was highlighted in multiple media outlets both nationally and internationally including Science World Report.

This journal article, published in Angewandte Chemie, has three co-authors who are from the CSMS research team: Dr. Dean Webster, Dr. Mukund Sibi and Dr. Jayaraman Sivaguru.

The article can be accessed at

<http://onlinelibrary.wiley.com/doi/10.1002/anie.201408492/supinfo>

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CSMS researchers co-author article in Journal of Coatings Technology and Research  
September 28, 2015

AssocPhotoA journal article that several CSMS researchers helped to write was published in the Journal of Coatings Technology and Research and has been featured on the European Coatings website under the Raw materials & Technology section. The date of the item is September 21, 2015 and the article is titled 'Novel alkyd-type coating resins produced using cationic polymerisation'. Click here for a link to download the article.

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