

Publications

February 2020

- Budishevskaya, O.; Popadyuk, N.; Musyanovych A.; Kohut, A.; Donchak, V.; Voronov, A.; & Voronov, S. (2020). Formation of Three-Dimensional Polymer Structures Through Radical and Ionic Reactions of Peroxychitosan In Atta-Ur-Rahman (Ed), *Studies in Natural Product Chemistry (Bioactive Natural Products)* (pp. 365-390). Elsevier.
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Activities

The Center for Sustainable Materials Science, (CSMS), research team will be involved in activities to support the goals of the North Dakota EPSCoR award's EMPOWERED-ND initiative, which stands for Emerging Programs for Workforce Development, Outreach, Education and Diversity-North Dakota, a tightly integrated workforce development, education and outreach and partnership program designed to ensure a continual pipeline of highly qualified individuals to meet the future needs of the North Dakota economy.

Some of the goals identified for this EMPOWERED-ND initiative, that fall under three Project Element areas, that apply to CSMS are shown below.

Diversity

Co-Leads: Chad Ulven/NDSU and Scott Hanson/ND EPSCoR

Build on the success of our K-12 NATURE programs by including more CSMS-related themes into NATURE University Summer Camp and Sunday Academy programming

Help to identify American Indian students interested in pursuing and eventually obtaining PhDs in STEM programs and who are willing to maintain contact with a Tribal College faculty member or administrator

Increase the participation level of women faculty in CSMS

Increase the number of American Indian and women role models participating in CSMS-related themes during NATURE University Summer Camp and Sunday Academy programming.

Education and Workforce Development

Co-Leads: Rachel Navarro and Ryan Summers/UND

Increase K 12 student self-efficacy in science, technology, engineering and mathematics (STEM)

Increase student interest in STEM.

Increase student intentions to pursue a STEM major and increase higher education retention in those fields.

Build capacity for interdisciplinary research state-wide and initiate collaboration with partner institutions (Tribal Colleges and Primarily Undergraduate Institutions) and sustain these research collaborations.

Engage undergraduate and graduate students, postdoctoral researcher associates and CSMS research faculty in expanding research and provide educational and research opportunities to underrepresented groups and younger learners from other North Dakota institutions. See the CSMS Outreach page for listings by award year of Outreach carried out by CSMS students and postdoctoral researchers.

Partnership, Collaboration and Communication Objectives

PCC Co-Leads: Mukund Sibi/NDSU; Tara Kopplin/UND

Communication Co-Leads: Zoltan Majdik/NDSU; Brad Rundquist/UND

Develop partnerships to advance the CSMS science and engineering infrastructure and translational research opportunities; specifically academic and industrial collaborations.

Establish and maintain partnerships with DoE and USDA national labs, provide for student internship at DoE and/or USDA labs.

Collaborate with North Dakota and regional industry (Minnesota, Montana and South Dakota) to identify and support summer internships.

Work on projects with the Center for Regional Climate Studies (CRCS), another center funded by this North Dakota EPSCoR award. The website for CRCS is <http://und-crcs.org/>

Communicate on scientific accomplishments and activities to enhance awareness of ongoing CSMS achievements and results (ex: educational webinars, blog posts, and news items).

Diversity

This page highlights the CSMS activities that have supported the Diversity project element of the ND EPSCoR award that currently funds CSMS.

Year 1 (August 2014 – July 2015)

CSMS-related activity 'Reactions With Light', led by R. Krishnan, R. Raghunathan and K. Kalliokoski, was taught during the 2014-2015 Sunday Academy program

Two female graduate students from CSMS, R. Raghunathan and K. Kalliokoski, helped teach the 'Reactions With Light' lesson with Postdoc R. Krishnan at the five Tribal Colleges in North Dakota

Audrey LaVallie, Chemistry Instructor at Turtle Mountain Community College, was a CSMS faculty researcher

Dr. Erika Offerdahl, NDSU instructor in Biological Sciences, was a CSMS faculty researcher until July 2015

Year 2 (August 2015 – July 2016)

CSMS-related activity 'Purification of Water with Biobased Materials', led by Long Jiang and graduate students A. Clay and A. Iyer, was taught during the 2015-2016 Sunday Academy program

Female graduate student A. Iyer helped teach the 'Purification of Water with Biobased Materials' lesson with graduate student A. Clay at the five Tribal Colleges in North Dakota

CSMS-related activity 'Engineered Composite Building Products', led by Dilpreet Bajwa, was taught during the 2015-2016 Sunday Academy program

Dr. Alena Kubátová, Chemistry Professor at the University of North Dakota, joined as a CSMS faculty researcher in May 2016

Audrey LaVallie, Chemistry Instructor at Turtle Mountain Community College, was a CSMS faculty researcher until August 2016 when she became a graduate student under Dr. Alena Kubátová at the University of North Dakota

Year 3 (August 2016 – July 2017)

CSMS-related activity 'Bio-based Materials', led by graduate students A. Clay and R. Singathi, was taught during the 2016-2017 Sunday Academy program

Year 4 (August 2017 – July 2018)

CSMS-related activity 'Recycling Bioplastics', led by Alex Parent, was taught during the 2017-2018 Sunday Academy program

Dr. Ghasideh Pourhashem, Assistant Professor, Coatings and Polymeric Materials at North Dakota State University, joined as a CSMS faculty researcher November 2017

Dr. Marisol Berti, Professor, Plant Sciences at North Dakota State University, joined as a CSMS faculty researcher January 2018

Year 5 (August 2018 – July 2019)

CSMS-related activity 'Polymer Synthesis from Common Materials', led by Alex Parent, was taught during the 2018-2019 Sunday Academy program

Michael Parker and Dr. Brent Voels from Cankdeska Cikana Community College moved from CRCS to CSMS research

Year 6 (August 2019 – July 2020)

CSMS-related activity 'Synthesis of Gold Nanoparticles', led by Alex Parent, was taught during the 2019-2020 Sunday Academy program.

Education and Workforce Development

This page highlights the CSMS activities that have supported the Education and Workforce Development project element of the ND EPSCoR award that currently funds CSMS.

Year 1 (August 2014 – July 2015)

CSMS involvement in NATURE University Camp and Sunday Academy programming helps in the effort to increase student interest in STEM fields.

CSMS research helps build capacity for interdisciplinary research state-wide with partner institutions Mayville State University, Minot State University, North Dakota State University, Sitting Bull College, Turtle Mountain Community College and the University of North Dakota. Approximately 7 Postdocs, 17 graduate students, and 15 undergraduate students were active with CSMS at some point during the 2014-2015 fiscal year.

CSMS students and Postdocs have helped in the effort to provide educational opportunities to underrepresented groups and younger learners through Outreach involvement.

This includes outreach with the NATURE Sunday Academy programming that is for tribal middle and high school students, and is taught at the five Tribal Colleges in North Dakota, as well as general Outreach at events such as the North Dakota Science Olympiad.

More outreach is included via links by fiscal year at the bottom of the Outreach page at <http://csms-ndsuo.org/activities/education-and-workforce-development/csms-outreach/> Year 2 (August 2015 – July 2016)

CSMS continues to be involved in NATURE Sunday Academy programming and also with NATURE University Summer Camp in the effort to increase student interest in STEM fields. CSMS research continues to build capacity for interdisciplinary research state-wide with partner institutions Mayville State University, Minot State University, North Dakota State University, Sitting Bull College, Turtle Mountain Community College and the University of North Dakota. Approximately 9 Postdocs, 23 graduate students, and 26 undergraduate students were active with CSMS at some point during the 2015-2016 fiscal year.

CSMS students and Postdocs continue to help in the effort to provide educational opportunities to underrepresented groups and younger learners through Outreach involvement.

This includes continuing outreach with the NATURE Sunday Academy programming as well as other CSMS related and general Outreach such as:

- STEM Makerspace in the Library (Grand Forks)
- Avenues of Scientific Discovery (Fargo)
- Expanding Your Horizons (Fargo)
- UND Chemistry Dept. STEM day for High School students (Grand Forks)
- UND Chemistry Department's 8th Annual High School Workshop (Grand Forks).

More outreach is included via links by fiscal year at the bottom of the Outreach page at <http://csms-ndsuo.org/activities/education-and-workforce-development/csms-outreach/> Year 3 (August 2016 – July 2017)

CSMS continues to be involved in NATURE Sunday Academy programming and also with NATURE University Summer Camp in the effort to increase student interest in STEM fields. CSMS research continues to build capacity for interdisciplinary research state-wide with partner institutions Mayville State University, Minot State University, North Dakota State University, Sitting Bull College, and the University of North Dakota.

Approximately 3 Postdocs, 29 graduate students, and 24 undergraduate students have been active with

CSMS during the 2016-2017 fiscal year.

CSMS students and Postdocs continue to help in the effort to provide educational opportunities to underrepresented groups and younger learners through Outreach involvement.

This includes continuing outreach with the NATURE Sunday Academy programming as well as other CSMS related and general Outreach such as:

- NDSU Parents Involvement with Children Nurturing Intellectual Curiosity in Science program (PICNICS)
- Research Experiences for Teachers (RET) program
- North Dakota Governor's School program
- Presentation by CSMS graduate students at an NDSU Chemistry Club meeting

More outreach is included via links by fiscal year at the bottom of the Outreach page at

<http://csms-ndsu.org/activities/education-and-workforce-development/csms-outreach/>
Year 4 (August 2017 – July 2018)

CSMS continues to be involved in NATURE Sunday Academy programming and also with NATURE University Summer Camp in the effort to increase student interest in STEM fields. CSMS research continues to build capacity for interdisciplinary research state-wide with partner institutions Mayville State University, Minot State University, North Dakota State University, Sitting Bull College, Turtle Mountain Community College and the University of North Dakota. Approximately 1 Postdoc, 28 graduate students, and 25 undergraduate students have been active with

CSMS during the 2017-2018 fiscal year.

CSMS students and Postdocs continue to help in the effort to provide educational opportunities to

underrepresented groups and younger learners through Outreach involvement.

This includes continuing outreach with STEM programs such as

- Avenues of Scientific Discovery
- discussing CSMS research to NDSU Summer Undergraduate Research Experience (SURE) program participants

More outreach is included via links by fiscal year at the bottom of the Outreach page at

<http://csms-ndsu.org/activities/education-and-workforce-development/csms-outreach/>
ND EPSCoR hired Paul Keidel as STEM Manager to oversee and be responsible for statewide education outreach to all stakeholders, and also to integrate education and workforce development elements with our research components with broader impact areas (i.e. Diversity and Partnerships, Collaboration and Communication)

Year 5 (August 2018 – July 2019)

CSMS continues to be involved in NATURE Sunday Academy programming and also with NATURE University Summer Camp in the ongoing effort to increase student interest in STEM fields.

Michael Parker and Dr. Brent Voels, with Cankdeska Cikana Community College, was added to the CSMS research group of institutions (Mayville State University, Minot State University, North Dakota State University, Sitting Bull College, Turtle Mountain Community College and the University of North Dakota)

Approximately 45 graduate students, and 21 undergraduate students have been active with CSMS during the 2018-2019 fiscal year.

CSMS graduate students continue to help in the effort to provide educational opportunities to underrepresented groups and younger learners through Outreach involvement.

This includes outreach with STEM programs such as

- Avenues of Scientific Discovery
- UND Chemistry Camp
- UND STEM Day hands-on activities
- Lab mentorship to Avenues to Disciplinary Research graduate student participant
- A Forensics station at the North Dakota Science Olympiad
- Science Fun Day, carrying out hands-on activities at an elementary school

More outreach is included via links by fiscal year at the bottom of the Outreach page at <http://csms-ndsu.org/activities/education-and-workforce-development/csms-outreach/>

ND EPSCoR hired Paula Comeau as STEM Manager to oversee and be responsible for statewide education outreach to all stakeholders, and also to integrate education and workforce development elements with our research components with broader impact areas (i.e. Diversity and Partnerships, Collaboration and Communication)

Year 6 (August 2019 – July 2020)

CSMS continues to be involved in NATURE Sunday Academy programming and also with NATURE University Summer Camp in the ongoing effort to increase student interest in STEM fields.

CSMS research continues to build capacity for interdisciplinary research state-wide with partner institutions: Cankdeska Cikana Community College, Mayville State University, Minot State University, North Dakota State University, Sitting Bull College and the University of North Dakota.

Approximately 1 Postdoc, 18 graduate students, and 20 undergraduate students have been active with

CSMS during the 2019-2020 fiscal year.

ND EPSCoR hired Shireen Alemadi as STEM Manager to replace Paula Comeau. Shireen will provide STEM support throughout the K-Ph.D. pathway, including professional development for K-12 teachers and postsecondary students and faculty.

CSMS graduate students continue to help in the effort to provide educational opportunities to underrepresented groups and younger learners through Outreach involvement.

This includes outreach with STEM programs such as

- Helping to organize, and support, activities at the NDSU-KU Symposium held October 2019
- A Halloween-themed event with theme-related lab activities
- Providing a Chemistry department tour for sophomore high-school aged students.

Partnerships, Collaborations and Communications

This page highlights some of the CSMS activities that have supported the Partnerships, Collaboration and Communication project element of the ND EPSCoR award that currently funds CSMS.

Year 1 (August 2014 – July 2015)

Dr. Dean Webster worked with Dr. Sylvain Caillol at the CNRS Charles Gerhardt Institute to get his sucrose soyate and epoxidized sucrose soyate samples functionalized by the Institute.

CSMS started to gather information for use in establishing this website to communicate about CSMS research and activities.

Year 2 (August 2015 – July 2016)

Dr. Chad Ulven established a project with the Composites Innovation Centre (CIC) in Winnipeg, Canada that is focused on natural flax fiber grading and development.

Dr. Webster is working with Zymergen to evaluate novel compounds made from biomass. Zymergen is making the compounds and Dr. Webster is evaluating compounds of interest in coatings applications.

Dr. Ulven is working with the USDA Forest Service Forest Products Laboratory to obtain cellulose nanocrystals (CNCs) for testing to enhance research activities in CSMS and to investigate new opportunities for wood byproducts.

Dr. Mohiuddin Quadir is working with Boston University checking intracellular and extracellular distribution of novel polymeric nanoparticles in mammalian cell lines.

Dr. Webster and Dr. Mukund Sibi worked with the University of Georgia to arrange the 1st International Symposium of Materials from Renewables that was held July 19-20, 2016 at NDSU. Sponsors of the symposium include ND EPSCoR, the United Soybean Board, the NDSU College of Science and Mathematics, the NDSU College of Engineering, and the NDSU College of Coatings and Polymeric Materials.

CSMS is identifying potential industry partners in North Dakota and Minnesota for student internships.

This new CSMS website went live January 2016. CSMS started to post news items, webinars about faculty CSMS research, information about expected activities and student Outreach, and publications by CSMS researchers.

Year 3 (August 2016 – July 2017)

Dr. Ulven continued to work with the USDA Forest Service Forest Products Laboratory to obtain cellulose nanocrystals (CNCs) for testing to enhance research activities in CSMS and to investigate new opportunities for wood byproducts.

Dr. Mohiuddin Quadir continues to work with Boston University checking intracellular and extracellular distribution of novel polymeric nanoparticles in mammalian cell lines.

Dr. Webster worked with AkzoNobel on a project to develop novel epoxies to replace bisphenol A-based coatings

At a meeting for all faculty researchers in the CSMS and CRCS research groups, faculty researchers from each research center met individually with researchers in the other research center to discuss their research and to look

for collaboration opportunities between their research centers.

Year 4 (August 2017 – July 2018)

Members of the CSMS team have some ongoing projects, which includes:

Drs. Sibi and Webster work with AkzoNobel, begun in 2015, is reaching completion

Dr. Ulven continues his work with the Composites Innovation Centre (CIC) related to natural flax fiber grading and development

Dr. Webster continues working with Zymergen evaluating novel compounds made from biomass

Dr. Mohiuddin Quadir continues to work with Boston University checking intracellular and extracellular distribution of novel polymeric nanoparticles in mammalian cell lines.

At a meeting for all faculty researchers in the CSMS and CRCS research groups, faculty researchers from each research center met individually with researchers in the other research center to discuss their research and to look for collaboration opportunities between their research centers.

To continue to improve ND EPSCoR's communication to all our constituents, and to increase awareness of EPSCoR activity across the state, ND EPSCoR hired Joyce Eisenbraun as Communication Manager

Year 5 (August 2018 – July 2019)

Members of the CSMS team have some ongoing projects, which includes:

Dr. Webster working with Zymergen (begun in 2015)

Dr. Chad Ulven continues work with the USDA Forest Service Forest Products Laboratory (begun in 2015)

CSMS researchers have the following new projects:

Dr. Voronov working with CNRS Charles Gerhardt Institute on synthesis and characterization of latexes from fully renewable monomer mixture

Dr. Voronov working with Clemson University on biobased nanofibers

Dr. Voronov working with University of Georgia on biobased nanocomposite materials

ND EPSCoR's Communication Manager Joyce Eisenbraun established a monthly ND EPSCoR newsletter that focuses on CSMS and CRCS research, other ND EPSCoR programs, and ND EPSCoR-related news and events. The newsletter archive can be found here

Year 5 (August 2019 – July 2020)

Members of the CSMS team have some ongoing projects, which includes:

Dr. Webster working with Zymergen (begun in 2015)

Dr. Voronov working with CNRS Charles Gerhardt Institute (begun in 2018), Clemson University (begun in 2018), and University of Georgia (begun 2017)

External Funding Awarded

Year 7 (July 2020 –)

Scaling Up Soy-Based Monomer Synthesis for Commercial Acceptance

Funding Agency: North Dakota Department of Agriculture

Award Amount: \$56,493.00

Award Dates: August 2020 – July 2021

Principal Investigator: Andriy Voronov (North Dakota State University)

Year 6 (August 2019 – July 2020)

Plastic Films from Corn Derivatives for Food Packaging

Funding Agency: North Dakota Corn Utilization Council

Award Amount: \$47,582.00

Award Dates: July 2020 – June 2021

Principal Investigator: Andriy Voronov (North Dakota State University)

Plant Oil-Based Latex Adhesives

Funding Agency: NSF – IUCRC

Award Amount: \$58,463.00

Award Dates: January 2020 – December 2020

Principal Investigator: Andriy Voronov (North Dakota State University)

Other Researcher/s: Ghasideh Pourhashem (North Dakota State University)

Collaborative Research: Engineering of Recoverable Cellulosomes for Biomass Conversion

Funding Agency: NSF – CBET

Award Amount: \$34,365.00

Award Dates: January 2020 – December 2020

Principal Investigator: Andriy Voronov (North Dakota State University)

Investigation of Wood Aging Using Thermal Desorption-Pyrolysis GC-MS

Funding Agency: Marvin Windows

Award Amount: \$40,361.00

Award Dates: January 2020 –

Principal Investigator: Alena Kubátová and Bin Yao (University of North Dakota)

Non-EPSCoR Co-PI: Evguenii Kozliak

Conversion of Corn Stover-Derived Lignin

Funding Agency: North Dakota Corn Utilization Council

Award Amount: \$79,000.00

Award Dates: November 5, 2019 –

Principal Investigator: Alena Kubátová (University of North Dakota); non-CSMS: Wayne Seames (University of North Dakota)

Year 5 (August 2018 – July 2019)

Plant Oil-Based Polymers for Personal Care Products

Funding Agency: North Dakota Agricultural Products Utilization Commission

Award Amount: \$30,000.00

Award Dates: July 26, 2019 – August 1, 2020

Principal Investigator: Andriy Voronov (North Dakota State University)

ZILA Works Technology Demonstrator

Funding Agency: North Dakota Department of Commerce / ZILA Works

Award Amount: \$32,000.00

Award Dates: June 12, 2019 – June 2020

Principal Investigator: Chad Ulven (North Dakota State University)

Self-healing Polymeric Materials from Corn Sugars

Funding Agency: North Dakota Corn Council

Award Amount: \$19,035.00

Award Dates: July 2019 – June 2020

Principal Investigator: Guodong Du (University of North Dakota)

New Corn Oil-Based Monomer Synthesis for Latex Applications in Coatings and Paints

Funding Agency: North Dakota Corn Utilization Council

Award Amount: \$52,522.00

Award Dates: July 2019 – June 2020

Principal Investigator: Andriy Voronov (North Dakota State University)

High oleic soybean oil as a plasticizer for crumb rubber for new rubber compounds

Funding Agency: United Soybean Board

Award Amount: \$98,086.00

Award Dates: October 2018 – September 2019

Principal Investigator: Dean Webster (North Dakota State University)

Other Researcher/s: Olena Shafranska (North Dakota State University)

High oleic soybean oil industrial uses and properties

Funding Agency: Ford Motor Company, United Soybean Board

Award Amount: \$62,664.00

Award Dates: October 2018 – September 2019

Principal Investigator: Dean Webster (North Dakota State University)

D3SC: Integrated Studies and Design of Organometallic Complexes with Nonlinear Optical and near-IR Emission Properties

Funding Agency: National Science Foundation

Award Amount: \$468,030.00

Award Dates: August 2018 – July 2021

Principal Investigator: Bakhtiyor Rasulev (North Dakota State University)

Co-Principal Investigator: Svetlana Kilina (North Dakota State University)

Other Researcher/s: Wenfang Sun, Dmitri Kilin (North Dakota State University)

Year 4 (August 2017 – July 2018)

Soy protein derived thermoset resins for traditional molding and 3D printing

Funding Agency: North Dakota Soybean Council

Award Amount: \$32,732.00

Award Dates: July 2018 – June 2019

Principal Investigator: Long Jiang (North Dakota State University)

Co-Principal Investigator: Mohiuddin Quadir (North Dakota State University)

Undergraduate Scholarships with Mathematics and Science Training, Exploration, and Research

Funding Agency: National Science Foundation

Award Amount: \$999,952.00

Award Dates: February 2018 – January 2023

Principal Investigator: Alena Kubátová (University of North Dakota)

Other EPSCoR Researcher/s: Rebecca Simmons, Gregory Vandenberg (University of North Dakota)

Other Researcher/s: Daphne Pedersen, Shari Nelson (University of North Dakota)

Factors affecting windows design and stability and their determination

Funding Agency: Marvin Windows and Doors

Award Amount: \$34,039.00

Award Dates: December 12, 2017 – December 2018

Principal Investigator: Alena Kubátová (University of North Dakota)

Other EPSCoR Researcher/s: Joshua Hatton (University of North Dakota)

Other Researcher/s: Evguenii Kozliak (University of North Dakota)

New High Oleic Soybean Oil(HOSO)-Based Latexes for Coatings and Paints

Funding Agency: United Soybean Board

Award Amount: \$106,647.00

Award Dates: October 2017 – September 2018

Principal Investigator: Andriy Voronov (North Dakota State University)

High oleic soybean oil in automotive rubber applications

Funding Agency: Ford Motor Company, United Soybean Board

Award Amount: \$61,684.00

Award Dates: October 2017 – September 2018

Principal Investigator: Dean Webster (North Dakota State University)

High Oleic Soybean Oil as a Plasticizer for Crumb Rubber for Tire Tread Compounds

Funding Agency: United Soybean Board

Award Amount: \$97,525.00

Award Dates: October 2017 – September 2018

Principal Investigator: Dean Webster (North Dakota State University)

Vegetable Oil-Based latex for Paints and Coatings

Funding Agency: ND Department of Commerce, Agricultural Products Utilization
Commission

Award Amount: \$25,000.00

Award Dates: September 2017 – August 2018

Principal Investigator: Andriy Voronov (North Dakota State University)

Year 3 (August 2016 – July 2017)

Development of ND Flax Fiber Mat for New Applications

Funding Agency: AmeriFlax

Award Amount: \$28,366.00

Award Dates: July 2017 – June 2018

Principal Investigator: Chad Ulven (North Dakota State University)

Additive Manufacturing for Mattress Comfort Customization

Funding Agency: North Dakota Department of Commerce

Award Amount: \$64,000.00

Award Dates: June 2017 – August 2018

Principal Investigator: Bashir Khoda (North Dakota State University)

Co-Principal Investigator: Chad Ulven (North Dakota State University)

Assisting Sunstrand in NSF SBIR Phase IIB Project

Funding Agency: Sunstrand, LLC

Award Amount: \$25,000.00

Award Dates: June 2017 – August 2018

Principal Investigator: Chad Ulven (North Dakota State University)

Co-Principal Investigator: Dean Webster (North Dakota State University)

IRES-IEGAC Interdisciplinary Environmental and Green Applications in Chemistry (IEGAC)

Funding Agency: National Science Foundation

Award Amount: \$249,956.00

Award Dates: August 2017 – July 2020

Principal Investigator: Alena Kubátová (University of North Dakota)

Co-Principal Investigator: Mukund Sibi (North Dakota State University)

Other Researcher/s: Evgenii Kozliak, David Pierce

Sanford Seed Grant: Nanocapsule mediated dietary delivery of arginine for acute wound healing

Funding Agency: Sanford Health

Award Amount: \$80,570.00

Award Dates: May 24, 2017 –

Principal Investigator: Mohiuddin Quadir (North Dakota State University)

Co-Principal Investigator: Long Jiang (North Dakota State University)

Modified Soybean Oil to Enhance Effectiveness as a Processing Oil for Rubber

Funding Agency: Ford Motor Company

Award Amount: \$99,806.00

Award Dates: December 2016 – September 2017

Principal Investigator: Bret Chisholm (North Dakota State University)

Other EPSCoR Researcher/s: Chad Ulven (North Dakota State University)

High Performance Bio-based Polymer Materials Systems

Funding Agency: Department of Defense

Award Amount: \$480,000.00

Award Dates: September 27, 2016 – September 25, 2018

Principal Investigator: Chad Ulven (North Dakota State University)

Other EPSCoR Researcher/s: Mukund Sibi, Dean Webster (North Dakota State University)

Biobased monomer and polymer systems for coatings

Funding Agency: Akzo Nobel

Award Amount: \$150,000.00

Award Dates: September 2016 – August 2017

Principal Investigator: Dean Webster (North Dakota State University)

Other EPSCoR Researcher/s: Mukund Sibi (North Dakota State University)

Synthesizing medical materials from corn bran: Corn meets Nanomedicine

Funding Agency: North Dakota Corn Council

Award Amount: \$4,999.00

Award Dates: August 16, 2016 –

Principal Investigator: Mohiuddin Quadir (North Dakota State University)

Co-Principal Investigator: Khwaja Hossain (Mayville State University)

Year 2 (August 2015 – July 2016)

Pyrolysis of Woody Biomass for Advanced Products

Funding Agency: National Science Foundation

Award Amount: \$50,000.00

Award Dates: July 15, 2016 – January 2018

Principal Investigator: Chad Ulven (North Dakota State University)

Further Development of ND Flax Fiber and Shive for Commercialization in ND

Funding Agency: AmeriFlax

Award Amount: \$32,866.00

Award Dates: July 2016 – June 2017

Principal Investigator: Chad Ulven (North Dakota State University)

Integration of Flax Fibers into Kinetics Advanced Composite Orthotics

Funding Agency: AmeriFlax

Award Amount: \$17,000.00

Award Dates: July 2016 – June 2017

Principal Investigator: Chad Ulven (North Dakota State University)

Modified Soybean Oil to Enhance Effectiveness as a Processing Oil for Rubber

Funding Agency: United Soybean Board

Award Amount: \$27,306.00

Award Dates: July 2016 – September 2016

Principal Investigator: Bret Chisholm (North Dakota State University)

Co-Principal Investigator: Olena Shafranska (North Dakota State University)

Other EPSCoR Researcher/s: Chad Ulven (North Dakota State University)

Integration of Composite Materials into Sprayer Boom Design – Prototype and Testing Completion

Funding Agency: AGCO Corporation

Award Amount: \$14,876.00

Award Dates: January 2016 – June 2016

Principal Investigator: Chad Ulven (North Dakota State University)

BiMAT Zymergen

Funding Agency: Zymergen, Inc.

Award Amount: \$360,000.00

Award Dates: September 23, 2015 – July 7, 2020

Principal Investigator: Dean Webster (North Dakota State University)

YEAR 1 (August 2014 – July 2015)

Modified Soybean Oil to Enhance Effectiveness as a Processing Oil for Rubber

Funding Agency: United Soybean Board

Award Amount: \$93,435.00

Award Dates: July 2015 – June 2017

Principal Investigator: Bret Chisholm (North Dakota State University)

Co-Principal Investigator/s: Chad Ulven (North Dakota State University)

Interdisciplinary Renewable and Environmental Chemistry – IREC

Funding Agency: National Science Foundation

Award Amount: \$270,000.00

Award Dates: June 2015 – May 2018

Principal Investigator: Alena Kubatova (University of North Dakota)

Other Researchers: Frank Bowman, Audrey LaVallie (University of North Dakota)

Further Natural Fiber Composites Development with FibreCITY

Funding Agency: Composites Innovation Centre Manitoba

Award Amount: \$32,000.00

Award Dates: January 6, 2015 – June 2017

Principal Investigator: Chad Ulven (North Dakota State University)

Integration of Composite Materials into Sprayer Boom Design – Year 8

Funding Agency: AGCO Corporation

Award Amount: \$48,000.00

Award Dates: January 2015 – December 2015

Principal Investigator: Chad Ulven (North Dakota State University)

Sensing Earth Environment Directly Sensor

Funding Agency: North Dakota Department of Commerce – Venture Grant

Award Amount: \$99,969.00

Award Dates: October 2014 – September 2015

Principal Investigator: Chad Ulven (North Dakota State University)

Co-Principal Investigator/s: Frederik Haring, Justin Hoey, and Robert Sailer (North Dakota State University)