

Bio-based Materials

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Lesson overview: Discussion and learned information on Bio based materials.

Lesson Objective(s): Students will explore the definition of Bio-based materials. Students will discuss the concept of Bio-based materials and its meaning. They will discuss what bio-based materials they use in their everyday lives. Native Americans contributed to the concept of Bio-based materials. Students will develop a list of bio-based materials that Native Americans contributed.

A **bio-based material** is a material intentionally made from substances derived from living (or once-living) organisms. These materials are sometimes referred to as [biomaterials](#), but this word also has another meaning. Strictly the definition could include many common materials such as [wood](#) and [leather](#), but it typically refers to modern materials that have undergone more extensive processing. Unprocessed materials may be called [biotic material](#). Bio-based materials or biomaterials fall under the broader category of [bio products](#) or bio-based products which includes materials, chemicals and energy derived from renewable biological resources. Bio-based materials are often [biodegradable](#), but this is not always the case. (wikipedia.org/wiki/Bio-based-material)

Vocabulary Definitions:

- **Biomaterials**- is a substance that has been engineered to interact with biological systems for a medical purpose, either a therapeutic or a diagnostic one. (Wikipedia.org)
- **Biotic material**- is any material that originates from [living organisms](#). Most such materials contain [carbon](#) and are capable of [decay](#). (Wikipedia.org)
- **Bio products**- are [materials](#), [chemicals](#) and [energy](#) derived from renewable biological resources. (Wikipedia.org)
- **Biodegradable**- is the breakdown of [organic matter](#) by [microorganisms](#), such as [bacteria](#) and [fungi](#). (Wikipedia.org)

Examples of Biomaterials include:

- [cellulose fibers](#) — fibers made from reconstituted cellulose.
- [casein](#) — a [phosphoprotein](#) extracted from milk during the process of creating low fat milk, it is processed in various ways to make: [plastic](#), dietary supplements for body builders, glue, [cotton candy](#), protective coatings, paints, and occurs naturally in cheese, giving it a creamy texture.

- [polylactic acid](#) — a [polymer](#) produced by [industrial fermentation](#)
- [bioplastics](#) — include a [soybean](#) oil based [plastic](#) now being used to make body panels for [John Deere tractors](#)
- [engineered wood](#) — products such as [oriented strand board](#) and [particle board](#)
- [zein](#) — a natural [biopolymer](#) which is the most abundant corn protein
- [cornstarch](#) — the starch of the maize grain, used to make packing pellets
- grease — lubricants made from vegetable oils, including soybean oil, that can replace petroleum based lubricants (Wikipedia.org)

Traditionally, Native Americans used Industrial Hemp for many things a long time ago. Hemp is a good example of a Bio product. Many Indian Tribes used Industrial Hemp for such things as making rope, string, stuffing for sleeping on, and clothing. (www.hempire.com/blogs/news/how-native-americans-use-hemp)

Today the processing of hemp is very complexed. **Make a list of 10 products that Industrial hemp is used for today. Research** and use **Google** as your tool to find out how Industrial Hemp is used today! Have a teacher led discussion on the subject matter while students are researching the topic of hemp.

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- 2.
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- 9.
- 10.

Other possible resources to research using “**Google**” as your research tool is; “Native American Contributions to the United States”. Make a list of 10 items and have a discussion on Native American Contributions.