



NYS Standards Addressed

Summary/ Overview:

In this activity students gain an understanding of polymers, their properties, and their uses. Also, they will look at how polymers, especially those found in non-renewable resources like fossil fuels, are consumed in society today. Finally, students will experiment with a polymer of the future that could allow for the mass production of bioplastics that could replace modern plastics which are made chiefly from petroleum-based resources. Bio plastics are truly unique because in many cases, they bio degrade if left in water producing no harmful waste which is something petroleum plastics cannot boast.

Established Goal(s) (National and/or NY State and/or District goal):

STANDARD 1—Analysis, Inquiry, Design, Problem solving

Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions

Engineering design is an iterative process involving modeling and optimization (finding the best solution within given constraints); this process is used to develop technological solutions to problems within given constraints.

STANDARD 2—Information Systems

Students will access, generate, process, and transfer information using appropriate technologies

STANDARD 4—The Physical Setting

Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science

STANDARD 6—Interconnectedness: Common Themes

Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning

Activity

Creation of a BioPlastic

Major Understandings/Objectives:

- Organic compounds contain carbon atoms which bond to one another in chains, rings, and networks to form a variety of structures.
- Organic compounds can be named using the IUPAC system.
- Develop a definition for polymer and monomer
- Plastic polymers can be generated using organic or inorganic based monomers
- Name and describe the uses of some important polymers
- Draw the basic structure of a common polymer

Summary

The purpose of this activity is for students to gain an understanding of polymers, their properties, and their uses. Also, they will look at how polymers, especially those found in non-renewable resources like fossil fuels, are consumed in society today. Finally, students will experiment with a polymer of the future that could allow for the mass production of bioplastics that could replace modern plastics which are made chiefly from petroleum-based resources.

- The process of polymerization can be modified in order to reduce the level of environmental contaminants
- In a covalent bond, one pair of electrons are shared between two atoms.
- Unsaturated organic compounds contain at least one double or triple bond
- Explain the difference between a renewable and non-renewable fuel
- The creation of bioplastics produces polymers that are both renewable and safer for the environment
- Demonstrate the proper use of lab safety procedures
- Write the chemical reaction for the creation of a polymer
- Explain the difference between condensation and addition polymerization
- The structure and arrangement of particles and their interactions determine the physical state of a substance at a given temperature

Extension Questions/activities:

Conduct or research a life cycle analysis on petroleum based plastic vs. bioplastic to determine cost and impact. Write a one page paper presenting your findings and explaining which plastic is the better environmental choice. Then discuss which is the more economically sound choice. If you were the owner of a company, which would you choose to manufacture and why?

Do you think we could meet the demand for plastic materials using bioplastics alone? Present evidence to support your argument.

Review this Washington Post article and discuss the evidence that BPA is safe or unsafe to use. Would your family be willing to spend an extra \$10 per month to buy things free from BPA? If you have access to the internet, research what alternatives may (or may not!) be available.