

Chemistry in Daily Life - Plastics

Samacheer, Science - Chemistry, Class – VI, Term – III, Unit - III

Plastics - Reduce Re-use Recycle

Most of us use plastics in some form or the other. Bottles to grocery bags to toys for children are made of plastics. We also know that plastics are dangerous and cause pollution. Let's take a closer look at understanding these plastics and how to use it to reduce the harmful impact on the environment.

Plastics are an important class of synthetic materials. They are organic polymers that are molded into different shapes by applying heat. These different polymers display a wide range of properties that make it suitable for a wide range of purposes.

Plastics are not biodegradable, hence they pollute the soil and affect the growth of plants. They emit toxic gases when burnt. Hence the alternate solution is to recycle the plastics. Recycling reduces the amount of resources required to produce plastics and thereby prevents them from filling the landfills. Most plastic containers have a recycling symbol: the symbol is a number ranging from 1-7 within a triangle with chasing arrows. These symbols are an indicator of the polymer type and give us information on whether it is safe or not. It also helps in segregating these materials for recycling. These symbols are however, not an indicator of how often the plastic can be recycled.

Identifying plastics using density as the property.

What if there is no symbol on a particular material? How do we identify or determine what it is made of? Since density is a property of a substance, each type of plastic has a different density. One good method to determine what type

a sample represents is by determining its density.

Objective:

The objective of this activity is to make students be able to identify and distinguish between different kinds of plastics. Students will also be able to learn about plastics that are safe to use and the importance of recycling them.

Before introducing density, students must be familiar with the concept of floating and sinking of objects and factors that affect that phenomena. So introduce the activity where students have to identify the plastic by doing the sinking and floating experiment using different liquids.

Materials Required:

Different solutions of varying density

- Vegetable oil – 0.92g/ml
- Water – 1.0g/ml
- Glycerin – 1.26g/ml

Pellets of the following four polymers.

- HDPE – High Density Poly Ethylene
- PP – Poly Propylene
- PS – Poly Styrene
- PETE – Poly Ethylene Terephthalate

Procedure

Divide the students into groups of 5 to carry out the experiment. Provide them with three jars, each containing a different solution and label it. Each group must drop the plastic piece into the

solution jar. Ensure that it is submerged in the solution. Avoid touching the solution with hands; use a clean stick to submerge it in water. Allow it sufficient time to see if the sample floats or sinks in the liquid. Begin the experiment with water and based on the result, the students will test the sample piece in the next liquid according to the flowchart until they identify the polymer. Students can note down their observations and inferences in the table below.

For example, first test the material with water. Observe the result. If it floats, test it in vegetable oil. If it floats, it is polypropylene. Repeat the process for the rest of the materials.

Flowchart

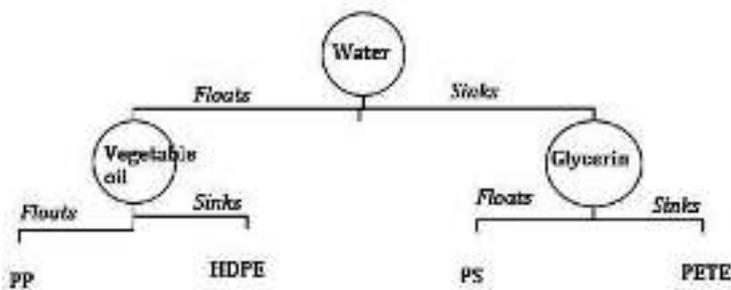


Table - 1

Sample	The liquid on which the sample floats/sinks	Plastic Type	Plastic Type

The following table provides an example of how the table needs to be filled.

A	Sinks in Glycerin	PETE	> 1.26
B	Sinks in Vegetable Oil	HDPE	> 0.92
C	Floats on Vegetable Oil	PP	< 0.92
D	Floats on Glycerin	PS	< 1.26

After the experiment, students can be asked to discuss their inferences. For example, what does it mean if the material sinks in a liquid and what does it mean if it floats. If students are familiar with the concept of density, they can try to predict the approximate densities of the materials since

the densities of the solutions are known.

Once the unknown samples have been identified, link them to the little triangles and numbers found on the bottom of plastic bottles and explain the significance of having a symbol and how it helps in sorting out the plastics.

Using the information sheet, discuss the properties and some of the possible recycled products from each type. Discuss the harmful effects of using plastics and the difficulties in degrading it. Introduce the concept of how plastics can be recycled and reused to reduce the impact on the environment. It must be told that plastics cannot be recycled back into the same product, but their properties can be manipulated chemically to create a new plastic object that may differ functionally from the original object. The best way is to avoid using plastics as much as possible. Nevertheless, 2, 4 and 5 are considered to be safe and has a lower risk of releasing toxic materials. These can be recycled and re-used. Avoid using and recycling plastics with symbols 3 and 6. While 1 is also considered relatively safe, it is best to reduce its usage as well.

Information Sheet

Recycling Symbol	Name of the Polymer	Sample Products	Recycled Products
1	PETE Polyethylene Terephthalate	Water bottles Food containers Rope Fabrics	Tote Bags Furniture Carpet Paneling
2	HDPE High Density Polyethylene	Milk jugs Grocery bags Toys Shampoo bottles	Pens Trash cans Flower pots Garden furniture
3	PVC Poly Vinyl Chloride	Medical equipment Cooking oil bottles Credit cards Drainage pipes	Floor mats Flexible hoses Playground equipment
4	LDPE Low Density Polyethylene	Bread bags Frozen food bags Grocery bags Container lids	Floor tile Furniture Garbage can liners Shipping envelopes
5	PP Polypropylene	Food containers Medicine bottles Rope Wrapping film	Video cassette cases Brooms Battery cables Signal lights
6	PS Polystyrene	Disposable utensils Foam cups Toys	Flower pots Egg cartons Thermometers Rulers

References: Vanderbilt Student Volunteers for Science. "Density Column Using Recycled Plastics". <http://www.nclark.net/Density Column.pdf> (6/13/14)

Activity Sheet

Identifying Plastics

Experiment Procedure

1. There are three jars, each containing a different solution.
2. First drop the piece of plastic into the jar containing water.
3. Avoid touching the solution with hands; use a clean stick to submerge it in water.
4. Wait for a few minutes. Check if the sample floats or sinks in the liquid.
5. Based on the result, test the sample piece in the next liquid according to the flowchart.
6. Note down your observations and inferences in the table below.

For example, if the sample floats in water, test it in vegetable oil. If it floats, it is polypropylene. Repeat the process for the rest of the materials.

Flowchart

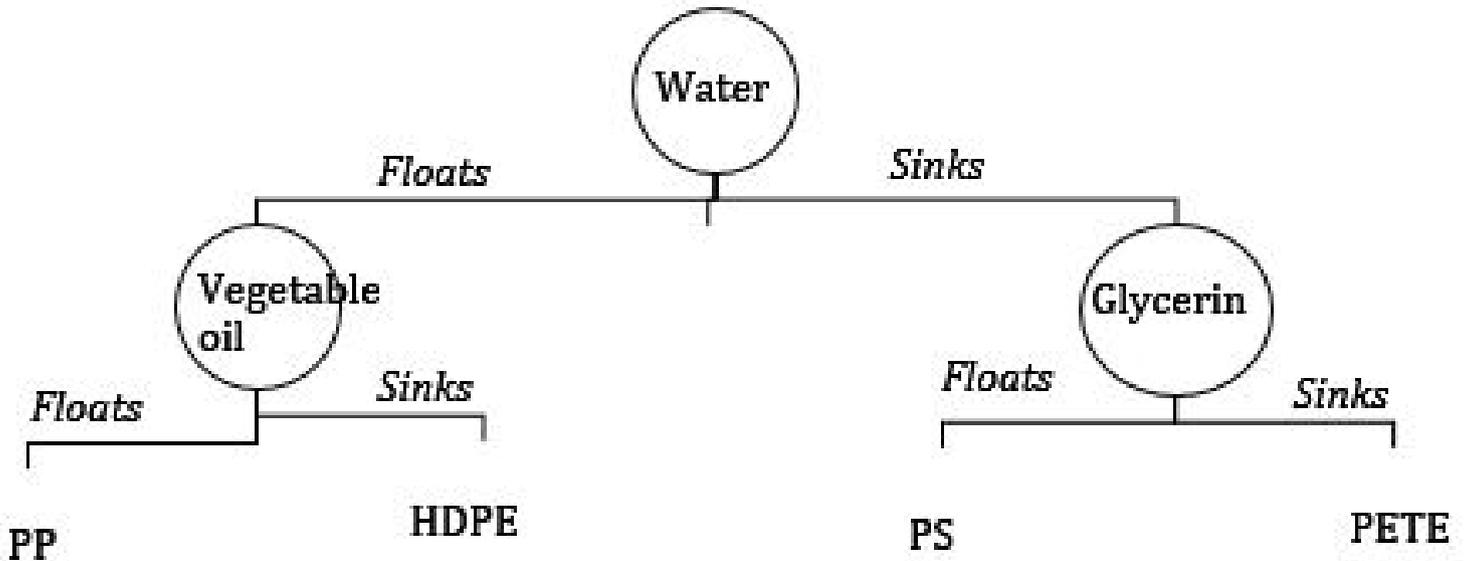


Table - 1

Sample	The liquid on which the sample floats/sinks	Plastic Type	Approx. Density