Quick Reference to Densities of Different Plastics and Examples

Density of Plastics	Examples
PETE (1) (Polyethylene terephthalate) 1.38-1.39 g/mL	Water bottles, soda bottles, peanut butter jars
LDPE (4) (Low-density polyethylene) 0.92-0.94 g/mL	Plastic bags
HDPE (2) (High-density polyethylene) 0.95-0.97 g/mL	shampoo containers
PP (5) (Polypropylene) 0.90-0.91 g/mL	Prescription medicine bottles
PS (6) (Polystyrene) 1.05-1.07 g/mL	disposable coffee cups
Other (7) (Polycarbonate/Lexan) 1.2 g/mL	cd bits
V (3) (Polyvinyl chloride) 1.18-1.30 g/mL	PVC

In the recycling process, densities can be used as a first step to separate plastics. A simplified version of this process is demonstrated in the laboratory. In actual recycling other chemicals may be needed. The table above serves as a quick reference for the the densities of different plastics along with samples of each kind.

Plastic samples of PETE (1), V (3) , and Other (7) will sink in all solutions. Unless students know something more about the items, it is acceptable to list unknown samples that sink in all solutions as possibilities in all three of these categories. Some students may recognize polyvinyl chloride as PVC, in which case they can go ahead and classify it as such. The Resin Identification Code Classification Chart can be passed out afterwards to allow students to further classify the items into their correct categories. In the reflect/assess section, students are challenged to come up with a way to further distinguish these three groups and determine their actual densities. One way would be to create additional solutions using denser liquids, such as dark karo syrup which has a density of about 1.37g/mL and could be diluted to make a few solutions of different densities. Students could explore this in the extension.

For unknown samples, the category may not be obvious. A plastic bag, for example, might also be placed in HDPE if it sinks in solution 2. This could happen if the particular plastic bag being sampled has a density on the higher range – 0.94 g/mL, and if there were some sources of error when mixing the solutions. The important concept is that plastics have different densities and can be sorted in this manner. More fine-tuned methods to determine density might be necessary to get down to the exact category in some cases.

ASTM International Resin Identification Coding System (RIC)

Polyethylene Terephthalate, or PETE is used to make many common household items like beverage bottles, medicine jars, peanut butter jars, combs, bean bags, and rope. Recycled PETE is used to make fabrics and carpets.

High-Density Polyethylene, or **HDPE** is quite stable and suitable for foods and drinks. It can be used to contain milk, motor oil, shampoos and conditioners, soap bottles, detergents, and bleaches, and to make children's toys—especially those that might be chewed. It can be recycled make plastic crates, plastic lumber, fencing, and more.

Polyvinyl Chloride, or **PVC** is used for plumbing pipes and tiles. It is not commonly recycled, but when it is, it can be used to make flooring, mobile home skirting, and other valuable products.

Low-Density Polyethylene, or **LDPE** is both durable and flexible and used to make plastic cling wrap, sandwich bags, squeezable bottles, and plastic grocery bags. It is not normally recycled in the standard municipal mix, but when placed in designated containers (often at the stores) it can be used to make garbage cans, lumber, furniture, and more.

Polypropylene, or **PP** is strong and can withstand higher temperatures than most plastics. It's found in plastic diapers, food containers, prescription bottles, and plastic coffee cups. Only a few municipal systems currently recycle it, but when it is reclaimed it can be used to make tools.

Polystyrene (Styrofoam), or **PS** can be recycled but often ends up in landfills because the recycling processes don't account for its low density. It's found in disposable coffee cups, plastic food boxes, plastic cutlery, packing foam, and packing peanuts are made from PS. It can be recycled to make license plates, rulers and other durable plastic objects.

If a plastic is unique and doesn't fit into another category it is classified in this one. Examples include polycarbonate, used to make water bottles, compact disks and some medical products. It can be recycled to make plastic lumber.