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U.S. Fire Administration / National Fire Academy

Coffee Break Training

Topic: Plastics (Part I: Introduction to Plastics)

Learning Objective: *The student shall be able to identify key terms related to plastics, elastomers, and rubberized products.*

Plasticized materials play an important part in our daily lives. Many products we use regularly are made of one or more plastic components. We often discuss how plastics affect fire behavior, but what exactly are "plastics"?

Today's Coffee Break Training is the first of a five-part series discussing plastics and their influence on fire protection.

"Plastics" are materials made from petroleum stock, and are capable of being molded, extruded, or cast into various shapes. There are many different kinds of plastic made from different combinations of compounds. Any material made of polymeric organic compounds and additives that can be shaped by flow.

Office products and furniture are just some of plastics' many uses.

"Polymers" include any of numerous natural and synthetic compounds of usually high molecular weight consisting of up to millions of repeated linked units, each a relatively light and simple molecule. A single molecule that can be chemically bound as a unit of a polymer is known as a "monomer."

"Elastomers" are polymers that resist and recover from deformation produced by force, and behave similarly to natural rubber. Elastomers consist of polymer molecule chains; those are crosslinked with each other in a network. Due to the crosslinked structure, the molecule chains cannot flow easily away from each other, therefore the material can't be melted without destroying the molecule chains itself.

"Rubber" is an elastic material obtained from the latex sap of trees (especially trees of the genera *Hevea* and *Ficus*) that can be vulcanized and finished into a variety of products, such as natural rubber, India rubber, gum elastic, caoutchouc, or balata.

In general, plastics have a higher heat of combustion and rate of heat release that determines how they behave in a fire. These characteristics will be discussed in next week's Coffee Break Training.

You can obtain more information about plastics from the American Plastics Council at *www.plastics-info.com*