Elastomers Encyclopedia Article

Elastomers

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Elastomers

An elastomer is a cross-linked, non-crystalline polymer above its **glass** transition **temperature** (a characteristic transition point at which a material's physical behavior changes from rigid to rubbery). Rubber bands probably provide the most familiar examples of elastomers. When an elastomer is deformed and released (provided the temperature exceeds the material's glass transition temperature), it snaps back with typical rubber-like behavior. The stress required to deform an elastomer depends on the number of linkages (called crosslinks) among the material's constituent macromolecules, the extent of deformation, and the temperature.

Elastomers may fall into any one of four categories: diene elastomers, saturated elastomers, thermoplastic elastomers, or inorganic elastomers. Diene elastomers have structures based on the molecules butadiene, isoprene, and/or their derivatives or copolymers. Natural rubber (polyisoprene), the first known elastomer, is a member of the diene elasomer family. So are polybutadiene, polychloroprene, and styrene-butadiene rubber. Diene elastomers can be recognized by the presence of double bonds in the main **chains** of the macromolecular molecules.

Saturated elastomers, which include the polyacrylates, have no double bonds in their main chains, which is to say that the chains are saturated. Saturated elastomers are valued for their resistance to **oxygen**, **water**, and ultraviolet light.

Unlike diene and saturated elastomers, thermoplastic elastomers are physically, rather than chemically, cross-linked. They behave just like chemically cross-linked polymers at room temperature, but like uncross-linked polymers at higher temperatures. Thus, the elastomeric properties come and go with changes in temperature. This is a relatively new class of elastomer; examples include block copolymers containing at least three blocks (or segments).

Inorganic elastomers, such as silicone rubber, have good thermal properties and typically find use in high temperature applications.