Process Economics Program

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Polybutadiene Production by Lithium Catalyst

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Abstract

Polybutadiene is the second-largest-volume elastomer in the world. The primary end use includes automobile tires, followed by industrial applications (belts and hoses) and consumer items (golf balls). It is almost entirely produced by solution polymerization of butadiene, using catalysts based on lithium, or transition metals such as neodymium, cobalt, and nickel. The microstructure and physical properties of the polymer are determined largely by the catalyst system. Anionic polymerization using a lithium-based catalyst system provides one of the most versatile methods for producing polybutadiene. A variety of microstructures containing varying amounts of cis, trans and vinyl contents are achievable using the lithium catalyst. The reactor effluent contains elastomer dissolved in a large excess of solvent. It is typically coagulated and separated from the solvent using steam stripping. The solvent is recycled to the reactors, and the elastomer undergoes a series of polymer processing operations.

In this PEP report, we primarily focus on the solution polymerization of butadiene using a lithium catalyst. We review developments made since the publication of our previous PEP review on this subject in 1996. The process economics are presented for producing 50,000 MT/yr of polybutadiene product at a US Gulf Coast location.

While the processes are PEP’s independent interpretation of the companies’ patent literature and may not reflect in whole or in part the actual plant configuration, we do believe that they are sufficiently representative of the processes to estimate the plant economics within the range of accuracy for economic evaluations of the conceptual process designs.
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