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ExxonMobil Butyl Rubber Process

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Abstract

Butyl rubber, also known as IIR (isobutylene isoprene rubber), is produced by polymerization of 98 wt% isobutylene (IB) with about 2 wt% isoprene (IP). Halogenated butyl rubbers include BIIR (brominated isobutyl isoprene rubber, bromobutyl rubber) and CIIR (chlorinated isobutyl isoprene rubber). Currently, ExxonMobil and LANXESS are the world's major producers of butyl rubber and halogenated butyl rubber. Butyl rubber is used mainly for tires, tubes, and tire products.

Butyl rubber is typically produced by the cationic copolymerization of isobutylene with isoprene in the presence of a Friedel-Crafts catalyst at low temperature, around -100°C. Reacting a hexane solution of butyl rubber with elemental bromine or chlorine produces halogenated butyl rubber. In 2009, ExxonMobil announced the development of new breakthrough technology that enables a higher reaction temperature and other improvements for the efficient production of IIR. Based on these advances, ExxonMobil claims significant energy and capital investment savings.

This review examines developments in technology patented by ExxonMobil over the past 15 years for manufacture of IIR at higher temperature than previously possible, with subsequent conversion to BIIR. Recent technology disclosures by ExxonMobil for production of butyl and halobutyl rubbers are reviewed, the industry status of butyl rubber is updated, and process economics are estimated for bromobutyl rubber production. Lastly, an interactive module is included, the iPEP Navigator XOM Butyl Rubber Process tool, which provides a snapshot of the economics for the process and allows the user to select the units and global region of interest.

While the processes presented herein represent the IHS Chemical Process Economics Program's independent interpretation of ExxonMobil's patent literature and may not reflect in whole or in part the actual plant configuration, we do believe that they are sufficiently representative of plant conceptual process designs.

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