

A Three Step Synthesis of Polystyrene

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Abstract
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A Three Step Synthesis of Polystyrene

Polystyrene, a synthetic aromatic polymer, is an inexpensive source of hard plastic that is used in the production of common everyday objects such as: children's toys, plastic containers, and scientific instruments (test tubes, Petri dishes, etc.). Physically, it is clear in color and amorphous. Structurally, it consists of a long hydrocarbon chain with a phenyl group attached to every other carbon; a structure that characteristically allows for its vast commercial use because of its inexpensiveness, light weight, durability, resistance to moist conditions, and immense insulation capacity.

Polystyrene is created via the polymerization of styrene - a petroleum based, liquid hydrocarbon monomer. In this three-step synthesis, styrene is formed via the radical bromination of ethylbenzene and the elimination reaction of (1-bromo-ethyl)benzene. The styrene created in this first step is then polymerized to synthesize the final product of polystyrene. In efforts to make it environmentally friendly, principles of Green Chemistry were applied to this reaction. Green Chemistry is a philosophical movement that encourages the use of alternative and eco-friendly techniques and chemical reagents in place of those that are considered biohazards to the environment. In this three-step synthesis of polystyrene, ready-made benzoyl peroxide will be used in the preparation of (1 bromoethyl)benzene. In this effort, the reaction will be green because the process of synthesizing benzoyl peroxide is averted; thus reducing the environmental exposure time of the chemical reagents that would have been used to synthesize the benzoyl peroxide.

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