Flow synthesis of medium molecular weight polyisobutylene coinitiated by $AlCl_3$

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Flow synthesis of medium molecular weight polyisobutylene coinitiated by $AlCl_3$

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Abstract

In this work, we established a microflow reaction system, and systematically investigates the flow synthesis of medium molecular weight polyisobutylene (MPIB, 10000-100000 g mol^{-1}) coinitiated by neat $AlCl_3$ in the mixture of hexane and CH_2Cl_2. It includes (1) revealing the effects of mixing conditions and the evolution of polymer products, (2) proposing chain transfer dominated polymerization mechanism with considerations on the possibilities or rates of various chain reactions, (3) exploring the effects of diluent from the viewpoint of active species transformation to guide for the selection of diluent, (4) evaluating the effects of temperature to find a window capable of producing MPIBs with adjustable molecular weight, and (5) testing the polymerization process in high monomer concentration to enhance the productivity. Exploiting the perfect performances of a microflow system in mixing and residence time control, the adjustable molecular weight in the range from 20000 to 100000 g mol^{-1} was afforded at relative high temperatures (-30 ^{o}C to -10 ^{o}C). The reaction time for quantitative conversion could be decreased to 6 s. It potentially leads to a breakthrough for high efficiency MPIBs production.

Key words:

Cationic polymerization; isobutylene; medium molecular weight; flow synthesis