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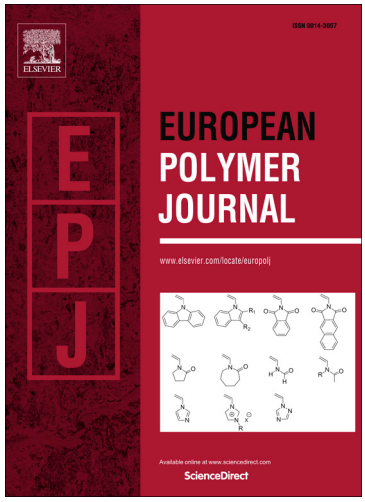

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Growth mechanism and structure of electrochemically synthesized dendritic polymethylsilane molecules

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ABSTRACT

The study of an electrochemical synthesis of polymethylsilane from trifunctional trichloromethylsilane monomers identified a single polymerization pathway involving reduction of the monomer to silyl anions and their addition to the growing polymer. The sizes of the synthesized macromolecules, measured with dynamic light scattering, are much larger than the theoretical size estimated for an ideal dendrimer. The reason for this, found by NMR analysis, is in a large number of branching irregularities (defects) contained in the molecular structure, which can be described as a hyperbranched dendritic polymer. Theoretical estimates of sizes for an ideal dendrimer were corrected assuming a branching defect is a cavity with the volume of one monomer. Appropriateness of the theoretical and experimental models was confirmed with a good quantitative agreement between the experimental densities and the theoretically calculated values.

Key words: polymethylsilane, dendritic polymer, electropolymerization