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Hydroxyl Functional Polybenzoxazine Precursor as a Versatile Platform for Post-Polymer Modifications

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Abstract

A new postmodification approach for the benzoxazine based thermosets is described. The approach involves attachment of hydroxyl functional groups to the main-chain polybenzoxazine precursors through monomer synthesis method. Hydroxyl functional polybenzoxazine precursor was successfully synthesized by using appropriate combinations of hexamethylene diamine with hydroxy functional diamine, namely 1,3-diaminopropan-2-ol in conjunction with bisphenol A and paraformaldehyde, and characterized. Modification reactions were performed by simple esterification reactions of hydroxyl groups with 2-bromopropanoyl chloride and methacryloyl chloride to yield ATRP macroinitiator and methacrylate containing polybenzoxazine precursors, respectively. ATRP macroinitiator was used to obtain polystyrene grafted polybenzoxazine precursors and photopolymerization of methacrylate groups was carried out successfully. The benzoxazine groups present in the all structures were shown to readily undergo thermally activated ring-opening polymerization in the absence of an added catalyst forming cross-linked networks. The thermal stability of the cured polymers was investigated and compared to that of a classical polybenzoxazine precursor.

Keywords

KeyWords Plus: RING-OPENING POLYMERIZATION; STRUCTURE-PROPERTY RELATIONSHIP; HIGH-PERFORMANCE THERMOSETS; MAIN-CHAIN; BENZOXAZINE MOIETIES; CLICK CHEMISTRY; MECHANICAL-PROPERTIES; PHENOLIC MATERIALS; COUPLING REACTION; 1,3-BENZOXAZINE

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