Synthesis of Self-Healing Elastomers by Scandium-Catalyzed Terpolymerization of Ethylene, Styrene and Dimethylaminophenyl-Substituted Propylene

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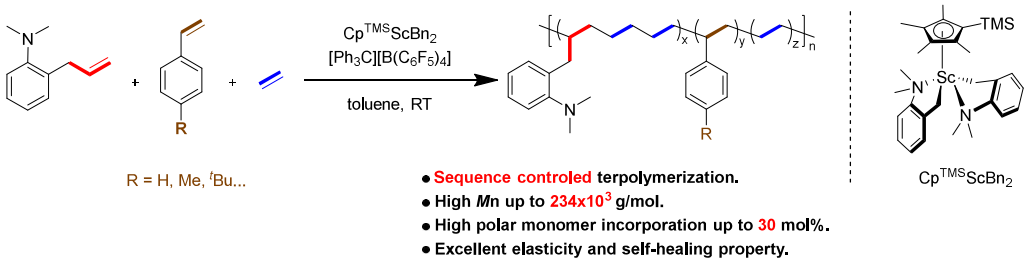
The copolymerization of nonpolar and polar olefins in a controlled fashion is of great interest and importance but has remained much underexplored to date. We recently found that the copolymerization of ethylene (**E**) and anisyl-substituted propylenes (**AP**) by a sterically demanding half-sandwich scandium catalyst afforded unique multiblock copolymers composed of relatively long **E**-*alt*-**AP** sequences and short E-E sequences, which exhibited excellent elasticity and self-healing properties because of the microphase separation of nanodomains of the crystalline E-E segments from a flexible **E**-*alt*-**AP** matrix.[1,2] To explore the influences of heteroatom functional groups on the copolymerization and the mechanical and self-healing properties of the resulting copolymers, we examined the analogous copolymerization reactions by using dimethylaminophenylpropylene (**AMP**) instead of anisylpropylene. Herein we report that the scandium-catalyzed terpolymerization of ethylene (**E**), dimethylaminophenylpropylene (**AMP**) and styrene (**St**) gave multiblock copolymers composed of relatively long **AMP-E-E** sequences, short **E-E** blocks and short **St-St** blocks. The terpolymer showed excellent elasticity and remarkable self-healing property, as a result of microphase separation of nanodomains of the crystalline **E-E** segments and the hard amorphous **St-St** segments from a very flexible **AMP-E-E** matrix.



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