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A Novel Adamantane-based Polyurethane with Shape Memory Effect

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Abstract: A novel adamantane-based polyurethane (AdPU) was synthesized via efficient ring-opening polymerization of 1,3,5,7-tetrahydroxyadamantane with ϵ -caprolactone followed by one-step polymerization of poly(ϵ -caprolactone) (PCL2000) with 1,6-hexamethylene diisocyanate (HDI). The incorporation of 1,3,5,7-tetrahydroxyadamantane enhanced the thermal stability of AdPU. It was found that AdPU was composed of a crystalline soft phase and an amorphous hard phase; and the aggregation of segments could form nano-sized crystal fibers by controlling the drying conditions. Finally, shape memory effect tests showed that AdPU has thermal-induced shape memory effect with good shape fixation and 85% shape recovery. This work opens a new avenue to design polyurethane frameworks with cubic geometry structure for shape memory applications.

Keywords: Polyurethanes; Shape memory materials; Crystalline phase; Thermal properties

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