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Biobased multiblock copolymers: Synthesis, properties and shape memory behavior of poly(hexamethylene 2,5-furandicarboxylate)-b-poly(ethylene glycol)

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Abstract: A series of novel multiblock copolymers poly(hexamethylene 2,5-furandicarboxylate)-b-poly(ethylene glycol) (PHFEGs) were synthesized from available biobased 2,5-furandicarboxylic acid (FDCA), 1,6-hexanediol (HD), and poly(ethylene glycol) (PEG) by a two-step melt polycondensation method. A systematic investigation of microstructure, molecular weight and its distribution, crystallization behavior, thermal stability of PHFEGs was performed using ^{1}H NMR, GPC, DSC, and TGA, respectively. Moreover, effects of composition on mechanical and shape memory properties of PHFEGs were investigated systematically. Results showed that the weight percentage of PEG in PHFEGs was consistent with that in feed. DSC data showed most PHFEGs were double-crystalline block copolymers. All PHFEGs exhibited the excellent thermal stability. In summary, compared with PHF, the addition of PEG toughened PHF to the extent and endowed the double-crystalline block copolymers with excellent shape-memory ability, suggesting PHFEGs with excellent shape-memory properties have great potential in application.

Keywords: Poly(hexylene 2,5-furandicarboxylate), 2,5-furandicarboxylic acid, poly(ethylene glycol), biobased polyester, shape memory