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Synthesis and properties of non-isocyanate aliphatic crystallizable thermoplastic poly(ether urethane) elastomers

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ABSTRACT: A simple non-isocyanate route synthesizing aliphatic thermoplastic polyurethane elastomers (TPUEs) with good thermal and mechanical properties is described. Melt transurethane co-polycondensation of a diurethanediol, i.e. bis(hydroxyethyl) hexanediurethane, with different poly(tetramethylene glycol)s was conducted, and a series of TPUEs were prepared. They were characterized by GPC, FT-IR, $^1\text{H-NMR}$, wide-angle X-ray scattering, differential scanning calorimetry, thermogravimetric analysis, dynamic mechanical analysis, atomic force microscope, and tensile test. The TPUEs exhibited an M_n up to 40000 g/mol, an M_w up to 90800 g/mol, T_m from 125 °C to 161 °C, initial decomposition temperature at over 261 °C, tensile strength up to 24 MPa, elongation at break from 182% to 1476%, and resilience up to 98%. TPUEs with high T_m , good tensile strength, and high resilience were prepared through a non-isocyanate route.

Keywords: Non-isocyanate route; Thermoplastic polyurethane elastomers; Transurethane polycondensation; Diurethanediol

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