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Hydrogenated ROMP Block Copolymers as Thermoplastic Elastomers JOHN BISHOP, RICHARD REGISTER, Princeton University — Thermoplastic elastomers (TPEs) are typically symmetric ABA triblock copolymers made up of a "soft" rubbery midblock (B) and "hard" endblocks (A) that are usually glassy. We have used living ring-opening metathesis polymerization (ROMP) and subsequent hydrogenation to synthesize TPEs with glassy and semicrystalline "hard" blocks. The hydrogenated ROMP polymers we use include hydrogenated polynorbornene (hPN), a highly crystalline polymer with Tm = 143C; hydrogenated polyhexylnorbornene (hPHN), a rubbery amorphous polymer with Tg = -22C; and hydrogenated polymethyltetracyclododecene (hPMTD), a glassy polymer with Tg = 163C. The mechanical properties of our amorphous hPMTD-hPHN-hPMTD TPEs, where microphase separation is driven by interblock repulsion, are comparable to commercially-available TPEs (also amorphous) at room temperature. In analogous hPN-hPHN-hPN triblocks, where the endblocks are crystalline instead of glassy, microphase separation is driven by crystallization from a homogeneous melt, resulting in materials that are much easier to process, and with superior solvent resistance. However, the hPN endblocks show plastic deformation at moderate strains, yielding tensile strengths for the semicrystalline TPEs below those of their amorphous counterparts.

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