

Structure and Mechanical Property of Highly Branched Polyethylene Thermoplastic Elastomers

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Highly branched polyethylene (PE) thermoplastic elastomer (TPE)s can be synthesized using Brookhart-type α -diimine nickel and palladium catalysts, which show a range of branching number and identity. In this work, we aim at elucidating the structure-property relationship of various PE-TPEs through solution-state and solid-state ^{13}C NMR spectroscopy and mechanical tensile testing. By applying solid-state NMR spectroscopy, DSC, and XRD, it was revealed that small degrees of crystallinity ($< 5\%$) yields polyethylenes that are sufficiently reinforced to exhibit TPE behavior. Across PE samples with similar branching numbers, we relate the effects of branch identity, crystallinity, and molecular weight on the tunable mechanical properties. The structure-property relationship of the PE-TPEs will be discussed.

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