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Structure-Property Relationships in Precise Acid-Containing Polymers FRANCISCO BUITRAGO, University of Pennsylvania, KATHLEEN OPPER[1], KENNETH WAGENER, University of Florida, KAREN WINEY, Univeristy of Pennsylvania, KAREN WINEY'S LAB TEAM, KENNETH WAGENER'S LAB TEAM — Acid-containing polymers have specific interactions that produce complex and hierarchical morphologies providing a remarkable combination of mechanical properties, namely being both dissipative and resilient. Despite the widespread industrial use of such materials, rigorous structure-property relationships remain elusive due to structural heterogeneity in the available copolymers. Recently, linear polyethylenes with pendent acid groups separated by a precisely controlled number of carbon atoms have been synthesized by acyclic diene metathesis (ADMET) polymerization. X-ray scattering shows that the molecular uniformity of these acid copolymers results in morphologies with nearly monodisperse acid aggregates and polyethylene crystals assembled in highly organized hierarchical structures. Taking advantage of these ordered morphologies to obtain well-defined mechanical data, we probe the elastic modulus, yield stress and second yield stress of precise acid-containing polymers as a function of the number of carbon atoms between acid groups, acid type (acrylic and phosphonic), and mono- or geminal acid functionalization.

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