Properties of Architecturally 'Perfect' Polyolefins: Pairing Synthesis with Metrology

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The role of branching in non-linear polyolefins is critical in the tailoring of solution and bulk properties such as those found in a new generation of thermoplastic elastomers based on polyethylene copolymers. With responsibility for mass reference materials, NIST sees a clear need for more advanced polymer structures beyond the traditional linear chains for the characterization of branch distributions, both in length of the branches and their distribution along the chain. To meet this demand, we are preparing near perfect short chain branched polymers and characterizing their intrinsic viscosity among other fundamental properties for potential use as standard reference materials, as well as to understand the very role that these branches play in tailoring other properties such as crystallization and phase separation. Time permitting, we will move beyond polyolefins, to new idealized polymers and network materials based on a combination of controlled polymerization tools, to explore the limits of new interfacial mechanics methods and to ferret out the roles of entanglements and dangling ends in polymeric networks.