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Identification of key deformation mechanisms of polyethylene materials via in-situ x-ray scattering THERESA HERMEL-DAVIDOCK, WILLEM DEGROOT, MEHMET DEMIRORS, BRIAN LANDES, RAJEN PATEL, TRACY PELTIER, Dow Chemical Company — Changes in the microstructure of ethylene based copolymers can be used to modify and enhance their mechanical performance. In this study, the effects of comonomer content, molecular weight, and molecular weight distribution on the mechanical performance of select polyethylene polymers were examined. Two key performance parameters for commercial polymer materials, especially in the area of blown film applications, are tear resistance and puncture resistance. However, polyethylene films exhibiting very different Dart and Elmendorf tear values cannot be differentiated by standard tensile test methods even though they exhibit very similar morphology. Alternative methods to link morphology and mechanical response need to be found. Wide-angle and small-angle x-ray scattering was collected during in-situ tensile testing to understand how compositional and structural differences affect the mechanical response of semicrystalline polyethylene polymers. Microstructural changes observed during the in-situ deformation process are correlated to Elmendorf tear and Dart impact performance for both intrinsic and blown film samples.

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