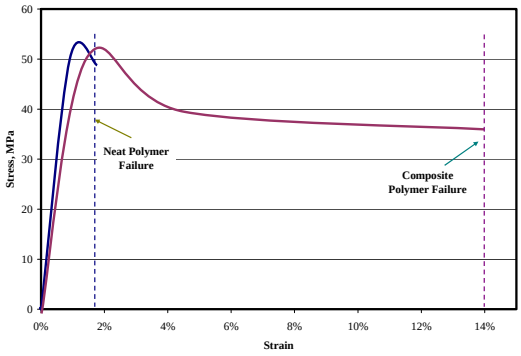
High Strain to Failure Materials for Automotive and Aerospace Applications



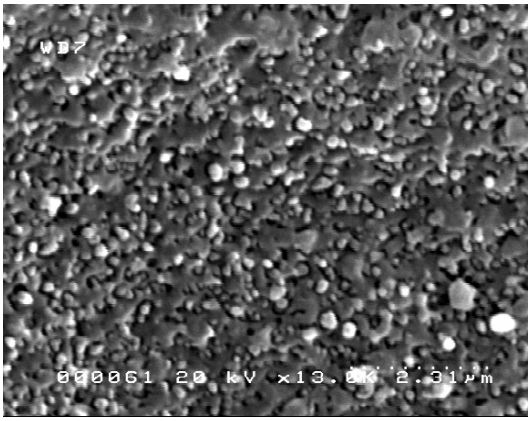
Overview

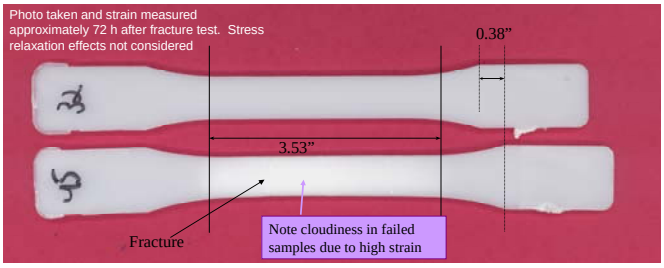
Tough, high strain to failure materials with good stiffness (modulus) are needed by all segments of industry and commerce, but the automotive and aerospace industries are particularly in need of such materials that are also inexpensive and/or lightweight. Traditional approaches have used exotic polymers (expensive) or ceramic fiber reinforced composites (heavy) to achieve these goals. AMIPP researchers are working towards preparing tough, high modulus materials from immiscible polymer blends.

Progress

The key to achieving toughness in combination with high modulus is to generate immiscible blends of materials that individually provide the necessary properties. Of course, the difficulty in achieving this is that most immiscible blends of tough [e. g. HDPE] and stiff [e. g. PMMA] polymers have miserable properties. Through specialized thermal processing of these immiscible blends, an extremely fine morphology is developed that permits efficient load transfer such that modulus is retained but which permits microstrain between the phases, thus inducing high strain prior to failure.

Figures: Fine domain size composites produce high strains and good modulus.





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