187i High-Throughput Screening of Mechanical Properties in Polymers

Pedro J. Zapata, Joe-Lahai Sormana, and Carson Meredith

Combinatorial techniques (CT) have gained traction in both academia and industry as a viable alternative in polymer research. Briefly, CT allow exploration of large variable spaces by performing experiments involving several distinct combinations of parameters. Numerous methods have been developed for preparing polymeric gradient (continuous) and discrete libraries that permit such multi-parameter approach. The main challenge in CT, however, lies in the efficient characterization of the libraries to obtain useful information, for instance, structure-property relationships. In polymer synthesis, developing and understanding structure-mechanical property relationships is vital The mechanical properties of polymeric materials are particularly sensitive to changes in chemistry and microstructure, and are crucial in determining their potential applications. We have recently developed an apparatus (HTMECH) for high-throughput screening of mechanical properties in two-dimensional polymer film libraries. This instrument is capable of operating at different strain rates and under different environmental conditions (temperature and humidity). In this presentation, we will present results that demonstrate the ability of this device to screen a broad range of homopolymers (glass, semi-crystalline, thermoplastic), polymer/silicate nanocomposites and interpenetrating networks. Deformation profiles from HTMECH are modeled using axi-symmetric membrane deformation mechanics.