Understanding temperature and time dependence of mechanical properties of thermoplastic elastomers

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Abstract

Thermoplastic elastomers (TPEs) are crosslinked via physical associations leading to high elasticity coupled with melt processability. Their mechanical properties are governed by the interplay of the different dynamics present in the system (e.g. hard block associations and soft block mobility) as well as by their morphology. Irrespective of their exact chemical structure or type of association (crystal, hydrogen bonded, or glassy domains…) many soft TPEs show a reduction in toughness at higher temperatures. We investigate the high temperature mechanical properties of these material with the aim to highlight the key parameters that influence the mechanical behavior and to build up a physical picture for the evolution of morphology and dynamics upon deformation. Focusing on a series of well-defined model TPEs, the influence of tuning composition and molecular weight on the mechanical properties as a function of temperature will be explored and the obtained results will be used to link the mechanical properties to the microstructure and its evolution.