Abstract

A typical thermoplastic polyurethane-urea (PUU) are (AB)n type block copolymers consisting of sequences of hard and soft segments. The foundational studies of this dissertation concern with the synthesis and crystallization pattern of poly(urethane-urea/amide)s (PUU/A) using different chain extenders molecules that are typically used to promote a microphase separated morphology that intern gives useful characteristics to these materials. The versatility of chemistry allows the synthesis of poly(urethane-urea/amide)s with a wide range of polymers which consists of three basic components: an aromatic or aliphatic diisocyanate (hard segment), a functionalized polyols (soft segment) and a short chain extender a diamine and or long chain extender diamine-diamide. The functionalized polystyrene is used as a soft segment which is synthesized using Atom Transfer Radical Polymerization (ATRP) method with strong base techniques. The diamine-diamide segments are synthesized by single step reaction. The effect of type of hard segment and the concentration of hard segment on thermal and crystallization properties of these copolymers is studied. The crystallization properties are related to the morphology of the copolymers. Additionally, the factors that influence the crystallinity of the copolymers, such as the nature, the concentration and the length of the crystallizable segment is also are investigated. Other parameters studied are the solvent resistivity and the swelling ratio properties of the synthesized PUU and PUUA. The relationship between the solvent resistances to that of type of hard segments in the PU is investigated in detail.