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Architectural effects in strongly hydrogen bonded thermoplastic elastomers KATHLEEN FELDMAN, CRAIG HAWKER, EDWARD KRAMER, University of California, Santa Barbara — In this work we demonstrate the synthesis of random copolymers of n-butyl acrylate with a quadruple hydrogen bonding acrylate monomer based on 2-ureido-4[1H]-pyrimidinone (UPy). Despite low T_gs and a lack of crystallinity, these materials show thermoplastic elastomer properties through the strong but thermoreversible UPy groups. Through the use of controlled radical polymerization and post-polymerization functionalization we are able to reach high UPy monomer content while maintaining low polydispersity and excellent control over the total molecular weight. It was found that the average distance between UPys along the chain was the major determiner of the overall properties including the plateau modulus, tensile modulus, and relaxation timescale. By using a difunctional initiator it is also possible to synthesize materials containing a homopolymer midblock and random copolymer end blocks, allowing us to address the question of how the MHB group distribution along the chain affects the bulk properties. In concentrating the UPy groups near the chain ends, the plateau modulus remained constant but the crossover frequency decreased dramatically, indicating that the effective lifetime of the hydrogen bonds within the supramolecular network increased, in keeping with prior theoretical predictions.

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