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Step Cycle Deformation Processing of Elastomers and Gels Based on Semicrystalline Polyolefin-based Block Copolymers FANNY DEPLACE, ZHIGANG WANG, NATHANIEL A. LYND, ATSUSHI HOTTA, GLENN H. FREDRICKSON, EDWARD J. KRAMER, UCSB - MC CAM, JEFFREY M. ROSE, ANNA E. CHERIAN, GEOFFREY W. COATES, Cornell University, HISASHI OHTAKI, K. HIROKANE, F. YAMADA, YONG-WOO SHIN, FUMIHIKO SHIMIZU, Mitsubishi Chemical Group, Science and Technology Research Center — Recent catalysts have enabled the synthesis of block copolymers with semicrystalline syndiotactic and isotactic polypropylene endblocks and amorphous ethylene-r-propylene midblocks. In these copolymers, the crystals play the role of physical crosslinks which can deform plastically under stretching. Neat elastomers, gels in mineral oil and gels from which mineral oil has been extracted have been subjected to step cycle tensile tests. The incremental plastic deformation of the crystals has dramatic effects on the true stress versus extension ratio curves. Moreover, small and wide angle X-ray scattering experiments during step cyclic tests revealed the evolution of the microstructure of the crystalline blocks: crystal fibrils and crystals in the fibrils are oriented parallel to the tensile direction at large strains and once the stress has decreased to zero, the fibrils return to being randomly oriented again.

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