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Melt-processable high acrylonitrile copolymers SHAWN R. HUTCHINSON, Institute of Textile Technology, JUAN HINESTROZA, Cornell University, BHUPENDER S. GUPTA, DAVID R. BUCHANAN, ALAN E. TONELLI, North Carolina State University — High acrylonitrile homo- and copolymers (PAN) are unique because of chemical, ultraviolet, and corrosion resistances. Historically, because of the atypical processing and thermal behavior of solution-processable PAN, consensus regarding the actual microstructure and paracrystalline order was elusive – it has been described as 'two-dimensional liquid crystalline-like structure with many defects.' New, sequence-structured copolymers rendered PAN for the first time melt-processable before degradation and are providing new insight into the solid state conformation. Solution ^{13}C nuclear magnetic resonance was used to compare the new and historical comonomer sequence lengths. Optimal processing conditions were obtained using capillary rheometry as a function of dwell time and melt temperature. A filament extrusion investigation was conducted and wide angle x-ray diffraction, differential scanning calorimetry thermograms and mechanical properties of the filaments were used to characterize the nonequilibrium melt transitions and paracrystal morphology as a function of processing parameters.

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