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Thermotropic Side Chain Liquid Crystalline Polypeptides KATHLEEN SCHAEFER, UCSB, EDWARD KRAMER, UCSB, PATRICK KELLER, Institut Curie-Section de Recherche, TIMOTHY DEMING, UCLA — Synthetic proteins can be produced by cloning the critical genes and expressing them in bacteria, but a simpler route to such materials was developed based on transition metal mediated ring opening polymerization of N-carboxyanhydrides (NCAs). To facilitate thermal processing of polypeptide melts, lysine-based NCAs were synthesized with mesogenic side chains. It was found by circular dichroism and wide angle x-ray scattering that all polymers adoped an α-helical backbone conformation with the mesogens oriented parallel to the helical axis. Nematic ordering of the mesogens was observed by polarized optical microscopy, and the solid to nematic transition temperature depended on the length of the flexible spacer connecting the mesogen to the backbone. Chain mobility in the nematic melt allowed fibers to be pulled; WAXS experiments showed a high degree of orientation of both the helix axis and nematic director with the fiber axis, demonstrating that the incorporation of liquid crystalline side chains allows polypeptide-based synthetic materials to be thermally processed.

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