Abstract Submitted for the MAR08 Meeting of The American Physical Society

Helix self-assembly through the coiling of cylindrical micelles. SHENG ZHONG, HONGGANG CUI, Department of Materials Science and Engineering and Delaware Biotechnology Institute, University of Delaware, ZHIYUN CHEN, KAREN WOOLEY, Center for Materials Innovation, Department of Chemistry and Department of Radiology, Washington University in Saint Louis, DAR-RIN POCHAN, Department of Materials Science and Engineering and Delaware Biotechnology Institute, University of Delaware — Both single and double helical superstructures with the length of several micrometers have been created through solution self-assembly of cylindrical micelles for the first time. Helical micelles which occur as a racemic mixture were formed from the co-assembly of poly(acrylic acid)-block-poly(methyl acrylate)-block-polystyrene triblock copolymers with triethylenetetramine or diethylenetriamine. Kinetic study reveals that the helix cylinders evolve from the stacking of intermediate micelle domains. The helix pitch could be efficiently adjusted by adjusting the amount and type of multiamine added. For example, the pitch distance would increase nearly 20% by increasing the relative molar amount of triethylenetetramine by 50% or substituting the tetraamine triethylenetetramine by the triamine diethylenetriamine. The helical structure exhibits unprecedented regularity for a nanostructure self-assembled from solution, which is proposed to be the result of long range electrostatic interactions coupled with uniaxial tension along the cylinder.

> Sheng Zhong Department of Materials Science and Engineering and Delaware Biotechnology Institute

Date submitted: 21 Nov 2007

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