Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Understanding the Self-Assembly of Amphiphilic Diblock Copolypeptides for Controlled Biomaterial Design LISA PAKSTIS, Univ. of Delaware, ANDREW NOWAK, ERIC HOLOWKA, TIMOTHY DEMING, UCLA, DARRIN POCHAN, Univ. of Delaware — Copolypeptides with a hydrophilic lysine (K) block and a hydrophobic leucine (L) block were designed to self-assemble due to their amphiphilic nature and the defined secondary structure of the hydrophobic block. In aqueous solution, these copolypeptides assemble into stiff, porous hydrogels at low volume fractions of polymer (vol. fraction polypeptide (0.5 wt%). Assembly is dictated by the secondary structure of the hydrophobic block and the polyelectrolytic character of the hydrophilic block, as revealed through microscopy and neutron scattering experiments. Understanding the self-assembly mechanism of amphiphilic diblock copolypeptides has led to the formation of a disparate range of materials. Vesicles can be produced by inducing curvature at the interface between the hydrophilic to hydrophobic blocks by altering either the charge density or the molecular weight of the polypeptide. Manipulation of the assembly kinetics, by dissolution of the polypeptide into an organic solvent with subsequent addition of water followed by evaporation of the organic component, produces twisted fibrils and hexagonal platelets. Characterization of these materials demonstrates that assembly is intrinsically controlled on the nanoscale by molecular design, most importantly by the presence of the alphahelical hydrophobic block, and can also be influenced by assembly kinetics and manipulation of electrostatic interactions of the charged blocks.

Lisa Pakstis
University of Delaware

Date submitted: 03 Dec 2005 Electronic form version 1.4