Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Polypeptide-Based Silicate Layered Nanocomposite: Effect of Poly(L-lysine) Secondary Conformation on Physical Properties of the Hybrid ROHAN HULE, Dept of Mat. Sci. and Engg. and Del. Biotech Inst., Univ of Delaware, Newark, DE 19716, JEFFREY THOMPSON, Dept of Mat. and Chem., UCSB, CA, 93106, TIMOTHY DEMING, Dept of Bioengg., UCLA, CA 90095, DARRIN POCHAN, Dept of Mat. Sci. and Engg. and Del. Biotech Inst., Univ of Delaware, Newark, DE 19716 — The formation of nanocomposites from poly(L-lysine) (PLL) as the matrix and reinforced by Na^{+}- MMT clay is discussed. By varying solution conditions such as pH, temperature and concentration in the presence of MMT, the secondary conformation of PLL was controllably altered into α-helical, β-sheet and random coil. Investigations were made into the PLL secondary conformation using FTIR, XRD and Circular Dichroism (CD). CD and FTIR revealed a strong propensity to fold into β-sheet when cast as films, irrespective of the initial secondary structure in solution. Two principles were observed for nanocomposite behavior: better mechanical properties at high molecular weight and controllable secondary structure at low molecular weight. Local morphology, observed using TEM and XRD confirmed the coexistence of intercalated and exfoliated MMT platelets over a wide range of compositions. Nanocomposite material properties relative to the secondary conformation of the matrix revealed significant enhancement in composite elastic modulus over neat polypeptides, with values comparable to traditional engineering polymers.

Rohan Hule
University of Delaware, Newark, DE 19716

Date submitted: 30 Nov 2005 Electronic form version 1.4