Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Hydration and phase separation of polyethylene glycol in copolymers of tyrosine derived carbonates. N. SANJEEVA MURTHY, Rutgers University, WENJIE WANG, University of Vermont, JOACHIM KOHN, Rutgers University — Effect of PEG fraction and its block size on the temperature-induced phase transitions and the hydration-induced phase separation were investigated in a copolymer of desaminotyrosyl tyrosine ethyl ester (DTE) and PEG using simultaneous SAXS/WAXS/DSC. The PEG segments crystallized when the block size was at least 2000 Daltons and present at $\sim$ 40 wt%, and raised the T_g of the polymer by $\sim$ 15 °C. The PEG blocks in dry polymers with up to 50 wt% PEG, even when crystalline, were found to be uniformly distributed with no evidence of phase separation at 10 nm length scales. The non-iodinated PEG-rich sample with 30 mole% PEG_{2k} showed the lower critical solution temperature (LCST) behavior with PEG blocks forming a separate phase above -21 °C. In the iodinated version of this polymer, the PEG_{2k} blocks were phase separated in the solid phase. In all samples, whether PEG was crystalline or not, hydration induced PEG to separate into 15 nm hydrated domains. Phase behavior was dependent on whether poly(DTE) or the PEG was the major (matrix) phase. Changes in the mobility of the chains brought about by water-mediated hydrogen-bonding, and modulated by heat, appear to be the common underlying explanation for the range of observed phase behavior.

N. Sanjeeva Murthy
Rutgers University

Date submitted: 17 Nov 2008 Electronic form version 1.4