

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Supercritical carbon dioxide induced surface melting/recrystallization process in ultrathin PEO films¹ NAISHENG JIANG, Stony Brook University, MITSUNORI ASADA, Kuraray Co., Ltd., PETER GIN, SO KING LAM, MAYA ENDOH, Stony Brook University, SUSHIL SATIJA, NIST, TAD KOGA, Stony Brook University — Crystallization of polymeric materials in nanoconfined geometries has attracted considerable attention in the past decade. In this talk, we will show the novel effects of supercritical carbon dioxide as a plasticizer in order to control the melting/crystallization behavior of semicrystalline polymer thin films. Poly(ethylene oxide) (PEO) thin films with thickness of 10nm-100nm were used for this study. In-situ neutron reflectivity technique was utilized to study the swelling behavior of deuterated PEO films in scCO₂ at T=50 °C, showing the clear evidence of the surface melting phenomenon even below the bulk melting temperature (65 °C). The surface structures before and after exposure at the different CO₂ process conditions were then investigated in air by using atomic force microscopy and grazing incidence x-ray diffraction. The results clearly showed that scCO₂-induced re-crystallization from the amorphous state via pressure quench results in various surface crystalline structures, depending on temperature, pressure, quench rates, and the film thickness.

¹We acknowledge the financial support provided by NSF CAREER AWARD under funding number CMMI-0846267.

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Date submitted: 17 Nov 2010

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