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Surface morphology in dewetting polystyrene/polyhedral oligomeric silsesquioxane (POSS) thin-film bilayers RITUPARNA PAUL, MICHAEL C. SWIFT, JOHN R. HOTTLE, ALAN R. ESKER, Macromolecules & Interfaces Institute, Department of Chemistry (0212), Virginia Tech, Blacksburg, VA 24061 — Polymer/polymer and polymer/nanoparticle bilayers on solid substrates are common in technological applications. Dewetting or the spontaneous formation of holes in polymer films above their glass transition temperature, poses a serious problem in the nanofabrication of polymeric multilayers. This study utilizes bilayer films of polystyrene (PS) and trisilanolphenyl- POSS (TPP) as a model to investigate the morphological evolution of polymer/nanoparticle bilayers upon annealing. X-ray photoelectron spectroscopy, and optical and atomic force microscopies have been used to study dewetting as a function of annealing time and temperature. Upon annealing the PS/TPP bilayers at 200 C, the upper TPP layer undergoes instantaneous cracking and these cracks serve as nucleation sites for dewetting of the TPP and PS layers for annealing times up to 90 minutes. For annealing times longer than 90 minutes, the dewetting of TPP and PS layers is complete resulting in the formation of TPP encapsulated PS droplets.

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