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Filling Small Pores With Polymer Melts PRIYANKA DOBRIYAL, MINGFU ZHANG , JIUN TAI CHEN, THOMAS RUSSELL, Department of Polymer Science and Engineering, University of Massachusetts, Amherst — Wetting of nanoporous inorganic templates by polymer melts is a well known and convenient way to generate polymeric nanostructures. In this work, we carried out a systematic study of wetting of nanoporous aluminum oxide membranes by polystyrene melts and obtained very different polymeric nanostructures (rods or tubes) under different conditions. When the annealing of polystyrene was done at temperature slightly above its glass transition temperature (T_g), nanorods were generated. When the annealing temperature was well above T_g, the resultant nanostructure depended on polymer molecular weight: for low molecular weight polystyrenes, nanotubes were obtained; for polystyrenes with very high molecular weights, however, nanorods formed. Thus, the viscosity of polymer melt controlled the nanostructure formation. When the viscosity of polymer melt was high, the capillary force was the dominant driving force which gave rise to the formation of nanorods; but when the melt viscosity was low, nanotubes formed and the wetting of the nanopores was achieved through the formation of precursor film.

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