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Unidirectional alignment of block copolymer templated porous films using solvent vapor annealing with soft shear ZHE QIANG, KEVIN CAVICCHI, BRYAN VOGT, The University of Akron — Porous films templated by block copolymers (BCPs) have been extensively investigated due to their potential numerous applications such as sorbents and nanolithography. However, in many cases, their performance critically depends on their nanostructural alignment and orientation. Achieving unidirectional alignment of these nanostructures over macroscopic dimensions is still challenging especially for BCPs with very high χ and Tg. Here, we illustrate a new method based on solvent vapor annealing with soft shear (SVA-SS), where a crosslinked poly(dimethylsiloxane) (PDMS) cap is simply adhered to the polymer films during SVA, to fabricate macroscopically aligned cylindrical structured mesoporous films using poly(styrene-block-N,N,-dimethyl-n-octadecylamine p-styrenesulfonate) (PS-b-PSS-DMODA) as the soft-template and phenolic resin as the precursor. The evolution of structures through the SVA-SS, thermal annealing and carbonization is determined by grazing incidence small angle x-ray scattering (GISAXS) and atomic force microscopy (AFM). Highly ordered mesoporous carbon films with S>0.8 can be obtained by this method. Potential applicability of this method to nanostructures besides cylinders, such as spheres and gyroid will be discussed.

Zhe Qiang
The University of Akron

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