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Simple, generalizable route to highly aligned block copolymer thin films ZHE QIANG, KEVIN CAVICCHI, BRYAN VOGT, Univ of Akron — Macroscopic alignment of block copolymer domains in thin films is desired for many applications, such as cell responsive surfaces or optical polarizers. Alignment generally requires specialized tools that apply external fields, shear force gradient, or produce topological patterned substrates. This requirement limits the broad academic application of aligned BCPs. Here, we describe a simple modification of commonly utilized solvent vapor annealing (SVA) process for macroscopic alignment of BCPs. Adhering a flat, crosslinked elastomer pad to the BCP film leads to differential swelling between the elastomer pad and BCP to produce a shear force that aligns the ordered BCP domains. The role of elastomer properties, solvent quality, drying rate and degree of segregation of the block copolymer will be discussed to provide generalized rules for alignment with this technique. Cylindrical nanostructures formed in polystyrene-block-polydimethylsiloxane can be transformed into arrays of silica lines and increasing the thickness from a monolayer to bilayer can effectively halve the spacing of the lines. These results illustrate a generalized method for BCP alignment and a potential route for the generation of complex hierarchical assembled structures.

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