

Structured Polymer Film Preparation by Spin Coating of Polymer/Solvent/Non-solvent

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Breath figure method is introduced to prepare porous polymer film with hexagonally packed pores of a specific size from a few hundred of nanometer to several micrometer. During spin coating, non-solvent of water is supplied from humid air and condensed on polymer/solvent solution. After complete drying of non-solvent(water) and solvent, traces of condensed water droplets remain in polymer film. Specially, when solvent is water miscible, humid environment could be avoid by adding small amount of water to polymer/solvent. Simply by increasing water content and decreasing rotating speed, pore size could be controlled in a one-step.

When boiling point of non-solvent is higher than that of solvent, non-solvent content increases due to active solvent evaporation during spin coating. Phase separation by increase in non-solvent content makes structure in spin-coated film. Phase separated film has different refractive index from compact film without phase separation. By varying polymer molecular weights and non-solvent content, optical thin films could be prepared, which have anti-reflection (AR) effect and different transmittances (or reflectance) of visible lights with various wavelengths.