Abstract Submitted
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Growth, non-coalescence and assembly of water drops that form ordered arrays over evaporating polymer solutions VIVEK SHARMA, School of Polymer, Textile and Fiber Engineering, MOHAN SRINIVASARAO, School of Polymer, Textile and Fiber Engineering, School of Chemistry and Biochemistry, Georgia Institute of Technology, Atlanta GA 30332 — Breath figures are patterns formed, when cold solid or liquid substrates contact humid air. Typically, the condensed water drops exhibit a range of sizes, and their self-similar growth is marked by coalescence in late stages. But in the breath figures formed on evaporating polymer solutions exposed to the blast of humid air, non-coalescent drops grow and self-assemble into close packed arrays of nearly monodisperse drops. These drops evaporate away leaving an ordered array of air bubbles in polymer film. In this study, we elucidate the physics that drives nucleation, growth, non-coalescence and assembly of drops. We compute the growth kinetics of a droplet population under the mass and heat transport of water vapor that are intimately coupled with the corresponding fluxes of the evaporating solvent. We elucidate the role of solvent, polymer and air flow conditions and determine why the drops are non-sticky and why drops and pores are monodisperse.

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