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Microstructure Evolution during Solvent Evaporation from Thin Film Polymer Mixtures NIGEL CLARKE, MIREILLE SOUCHE, Durham University, GAVIN BUXTON, Case Western Reserve University — We present simulations of the phase separation dynamics in a thin film polymer blend solution subject to solvent evaporation [1]. If the upper and lower surfaces are neutral with respect to the different components, we find that as the solvent diffuses through the film, and evaporates from the surface, phase separation becomes energetically favourable progressively throughout the film. This produces an ordering front which propagates through the film and leaves an ordered lateral morphology in its wake. In order to understand microstructure evolution if the surface interactions are strong enough that the film initially separates into a two layers, we have perfomed a linear analysis of the Marangoni instability of a deformable interface between two fluid layers of finite depths, submitted to a gradient of solvent concentration induced by the evaporation [2]. Qualitative comparison with experimental observations of spin-coating processes of solution of two immiscible polymers are then performed, yielding satisfactory agreement.
[1] G. A. Buxton and N.Clarke, Europhysics Letters, 78, 56006, 2007.
[2] M. Souche and N. Clarke, European Physical Journal E, in press.

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