Surface Wrinkling of a Polymeric Gel During Transient Swelling

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Swelling in hydrogel is a transient, diffusion driven process that results in differential swelling. Gels with certain geometrical constraints have been shown to exhibit bulk wrinkling in the equilibrium state. Due to the ability of gels to undergo enormous volume changes during swelling, the mismatch between the gel on the exterior and the interior causes large compressive stresses and gives rise to mechanical instabilities along the surface. Given time to equilibrium state. The analysis of surface wrinkling of gels are mostly limited to bilayers with significantly different material properties in equilibrium state. However, equilibrium analysis of gel swelling. Since the work of Tanaka, there has not been much work being done in studying the dynamical wrinkling process during transient swelling. In this work, we extend our previous work by employing the swelling kinetics of a polymeric gel methodology to investigate this interesting phenomenon.

Keywords: diffusion kinetics, surface wrinkling, polymeric gel, hyperelasticity