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Solvent-driven shape-memory effects for amorphous networks RUI XIAO, THAO NGUYEN, Johns Hopkins University — The swelling-induced shape memory behavior in polymers has inspired interest for their implications for biomedical applications. For amorphous polymers, the behavior is caused by a large decrease in the glass transition temperature caused by the absorption of a small amount of solvent. In this work, we present a theoretical model of the effect of low solvent concentration on the glass transition behavior of the materials. Specifically, the presence of solvent increases the configurational entropy; thus altering the temperature-dependence of the molecular mobility. The model was implemented numerically for finite element simulation. The computational model also considers the effect of diffusion process to describe more accurately the time-dependent effects of solvent-induced shape recovery behavior. To validate the model, we performed isothermal uniaxial tension tests on both the dry and fully saturated materials. Shape recovery performance was investigated by observing the shape change of an initially deformed sample in an isothermal water bath by using digital image tracking. Comparison between experimental data and simulations shows good agreement.

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