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Morphology of biaxially stretched triblock copolymer gels using SAXS ARJUN KRISHNAN, TUSHAR GHOSH, RICHARD SPONTAK, North Carolina State University — Gels of styrenic triblock copolymers swollen by a low-volatility, midblock-selective oil behave as high-strain, low-field dielectric elastomers in the design of electroactive polymeric actuators. A standard configuration of such devices involves stretching, or "prestraining," the elastomer film biaxially. However, little is known about the effect of biaxial prestrain on copolymer morphology. In this study, small-angle X-ray scattering (SAXS) is used to probe the nanostructure of gels composed of poly[styrene-*b*-(ethylene-*co*-butylene)-*b*-styrene] and mineral oil by systematically changing the concentration of polymer from 5 to 30 wt% and the biaxial prestrain from 0 to 300%. In the azimuthally integrated intensity profiles, the form factor due to scattering from polystyrene microdomains correlates strongly with polymer concentration and does not change with the applied prestrain, indicating that the polystyrene crosslinks remain as polydisperse spheres. The structure factor data correlates with prestrain, and is fitted using the Percus-Yevick approximation for interacting spheres. While a hard sphere interaction model is sufficient for unstrained gels, we resort to a square shoulder hard sphere potential for strained samples.

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