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Buckling instabilities in photopolymerised gels[1] MATTHEW HENNESSY, JOAO CABRAL, OMAR MATAR, Imperial College London — Frontal photopolymerisation (FPP) is a process whereby solid polymer networks are created by illuminating a monomer-rich bath with collimated light. In practice, FPP can be used to rapidly fabricate intricate small-scale structures. Due to the attenuation of light as it propagates through the bath, polymerisation occurs in a wave-like fashion from the illuminated surface into the bulk. At low temperatures, the polymerisation front remains planar; however, at higher temperatures, it can undergo large deformations. We believe this is due the buckling of a thin gel layer that forms between the polymer-rich and solvent-rich phases. The gel is thought to buckle due to high compressive stresses that are generated as it absorbs solvent and swells. In this talk, we will present a mathematical model for gel formation which captures the phenomenon of buckling due to swelling. The gel is treated as a deformable porous medium and the solvent is assumed to flow according to Darcy's law. We will also examine the buckling patterns that emerge from the model and compare them with experiments.

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