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New strategies in adaptive polymer gels

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Plants possess a remarkable ability to change their shape in response to the changes in ambient conditions. These transitions are believed to be governed by the non-uniform accumulation of elastic energy and the release of localized stresses. The self-shaping behaviour of plants offers a new paradigm for creating adaptable materials by-design, however currently prediction of three-dimensional transformations in soft matter remain a challenge. Here we report on the nature-inspired strategy for the generation of complex three-dimensional structures by programming stimuli-responsive deformations of a composite planar polymer gel sheet. This work constitutes a major step towards the preprogrammed design of adaptable soft materials with applications in sensing and actuation.