Abstract Submitted
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Optomechanical elastomeric engine MILOS KNEZEVIC, MARK WARNER, Cavendish Laboratory, University of Cambridge — Efficiently converting solar energy to mechanical or electrical energy is one of the greatest contemporary challenges in science and technology. We present a conceptual design for an engine based on liquid crystal elastomers (LCEs) that extracts mechanical work from heat or light. Unusual properties of LCEs arise from a coupling between the liquid crystalline ordering of mesogenic molecules and the elasticity of the underlying polymer network. The external heat or light cause reversible contractions of monodomain LCEs along their nematic director, with recovery elongations on stimuli removal. The contraction-elongation cycle can be repeated many times, and can be exploited to construct a continuosly operating engine. The material parameters and the geometry of such an engine are explored, and it is shown that its efficiency can go up to 20%.

[1] M. Knežević and M. Warner, Phys. Rev. E 88, 040501(R) (2013)
[2] I. Z. Steinberg, A. Oplatka, and A. Katchalsky, Nature 210, 568 (1966)

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