

Title: A cellulose liquid crystal motor: a steam engine of the second kind

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Abstract: The salient feature of liquid crystal elastomers and networks is strong coupling between orientational order and mechanical strain. Orientational order can be changed by a wide variety of stimuli, including the presence of moisture. Changes in the orientation of constituents give rise to stresses and strains, which result in changes in sample shape. We have utilized this effect to build soft cellulose-based motor driven by humidity. The motor consists of a circular loop of cellulose film, which passes over two wheels. When humid air is present near one of the wheels on one side of the film, with drier air elsewhere, rotation of the wheels results. As the wheels rotate, the humid film dries. The motor runs so long as the difference in humidity is maintained. Our cellulose liquid crystal motor thus extracts mechanical work from a difference in humidity.

KeywordsPlus: Films; Hydroxypropylcellulose; Deformation; Elastomers; Behavior; Water; Links

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