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CRITICALITY-CONTROLLED THERMOMECHANICAL RESPONSE IN LIQUID CRYSTAL ELASTOMERS

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A review of recent findings is given related to the giant thermoelastic properties of semi-soft liquid single-crystal elastomers (LSCEs). LSCEs are widely recognized as extremely promising soft materials for actuator, sensor, and artificial muscle applications due to the giant thermomechanical response, i.e., a large spontaneous change in geometry with temperature evolution of the paranematic-nematic order parameter. It is shown that, depending on the type of application, both side-chain and main-chain LSCE materials can be functionalized in the proximity of the liquid-vapor type critical point by varying the concentration of the crosslinking molecules so that the temperature profile of the spontaneous elongation/contraction exhibits an on-off, intermediate or continuous type response [1-3]. It is also shown that similar effect can be achieved by varying the frozen in mechanical field during the sample preparation and by changing the crosslinking temperature.

[1] A. Lebar, Z. Kutnjak, S. Zumer, H. Finkelmann, A. Sanchez-Ferrer, B. Zalar, Phys. Rev. Lett. 94, 197801 (2005).
[2] G. Cordoyiannis, A. Lebar, B. Zalar, S. Zumer, H. Finkelmann, Z. Kutnjak, Phys. Rev. Lett. 99, 197801 (2007).
[3] G. Cordoyiannis, A. Lebar, B. Rozic, B. Zalar, Z. Kutnjak, S. Zumer, F. Broemmel, S. Krause, H. Finkelmann, Macromolecules 42, 2069 (2009).