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**Title: Some current topics in liquid crystal elastomer research: deuterium NMR study of paranematic-nematic transition criticality and piezoresistivity of nanoparticle-reprocessed networks**

**Abstract:** Deuterium NMR is a sensitive experimental tool for investigations of the nature of the smeared paranematic-nematic phase transition in liquid single crystal elastomers (LSCEs). It shows that by increasing the concentration of crosslinking molecules, thermodynamic response of conventional LSCEs can be promoted from below-critical to supercritical. Conventional networks are inherently disordered systems with random-field induced smearing of criticality, manifested in distributed nematic order parameter values and weakly misaligned domains. LSCEs can also be rendered conducting by swelling in a toluene, doped by conducting carbon-black nanoparticles and carbon nanohorns. Such reprocessed LSCEs exhibit piezoresistive response and are applicable as mechanical actuators as their geometry can be controlled by changing the temperature via Joule heating.