American Chemical Society

235th National Meeting
April 6-10, 2008 New Orleans, LA

POLY 559 Thermo- and opto-mechanics of liquid crystal elastomers

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Already in 1950 Kuhn demonstrated that the collapse of a swollen polymer network might be applicable for mechanical actuators. The mechanical response time of this process, however, is limited by diffusion of the solvent. A faster response is expected for nematic elastomers (LSCE), where a change of the nematic order parameter causes a change of the macroscopic dimensions of the network. The change of the order parameter can be achieved either by temperature variation or by a reversible photo-chemical cis/trans isomerization reaction. The response time of the nematic network correspondingly depends on thermal conductivity or the cis/trans isomerization rate, presuming that the relaxation time of the network strands is faster. With this concept we realized nematic elastomers that reversibly change their shape in one dimension up to a factor > 3.

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The 235th ACS National Meeting, New Orleans, LA, April 6-10, 2008