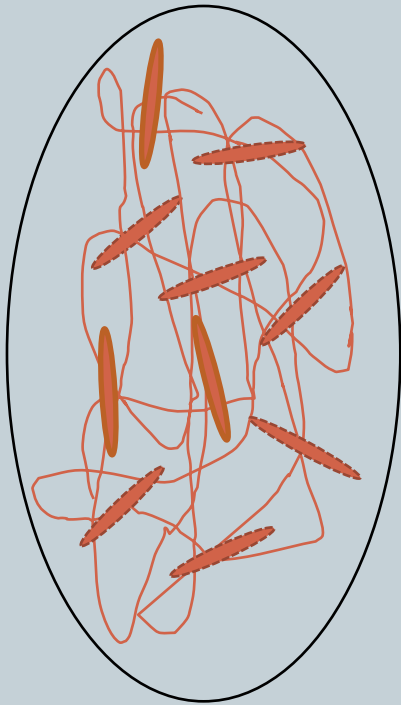


LCE swelling experiment



VIANNEY GIMENEZ
PROF. PETER PALFFY-MUHORAY

Liquid Crystal Elastomer



LC elastomers are polymer networks formed by cross linking liquid crystalline polymers.

These polymers are typically connected to rod like molecules that distort the conformation of the polymer

Fabrication of samples



Principal compounds

- Liquid Crystal Nematic Mesogen
- Polymer-Backbone
- Cross linker
- Toluene
- Catalyzer

Preheated centrifugation around 60 min

Stretching the elastomer for induced alignment.

Wash and Bake the elastomer

Liquid Crystal Elastomer



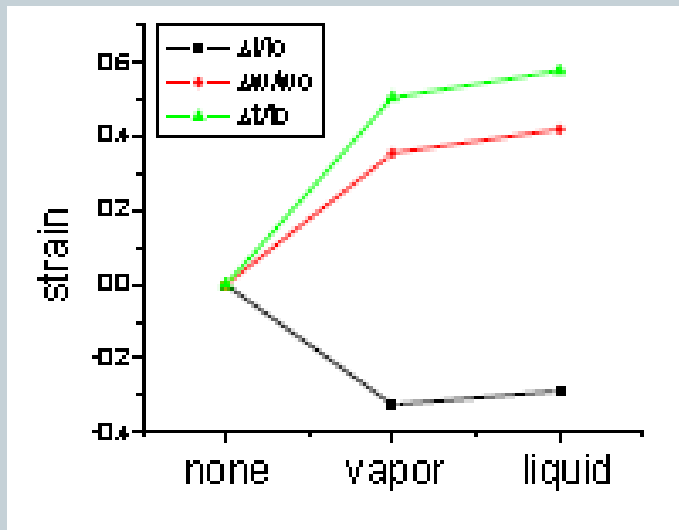
Coupling between strain and nematic tensor in free energy

$$Q_{ij} = \frac{1}{2}(3n_i n_j - \delta_{i,j})$$

$$e_{ij} = \frac{1}{2}(\partial_i u_j + \partial_j u_i + \partial_i u_k \partial_j u_k)$$

$$F = F_0 + \frac{\lambda}{2} e_{ii} e_{jj} + \mu e_{ij} e_{ij} + \frac{a}{2} (T - T_c) Q_{ij} Q_{ij} + \frac{b}{3} Q_{ij} Q_{jk} Q_{ki} + \frac{c}{4} Q_{ij} Q_{jk} Q_{kl} Q_{li} - \alpha Q_{ij} e_{ij}$$

Swelling mismatch



LCE in liquid solvent is more swollen than in vapor!

Swelling should be the same in liquid solvent and vapor solvent.

There is coexistence so chemical potential should be the same

Previous work.

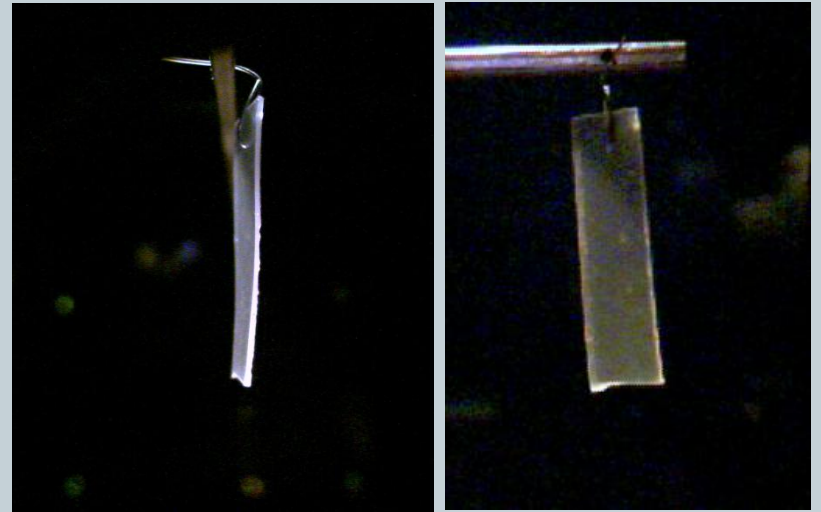
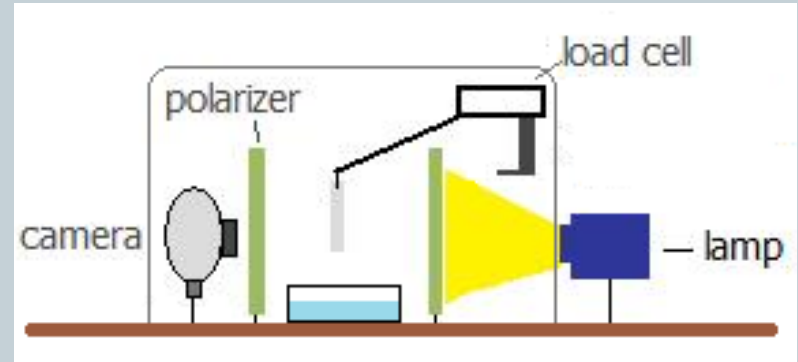
“Swelling Dynamics and Related Phenomena in NematicElastomers”

P. Palffy-Muhoray, P. Luchette, et al

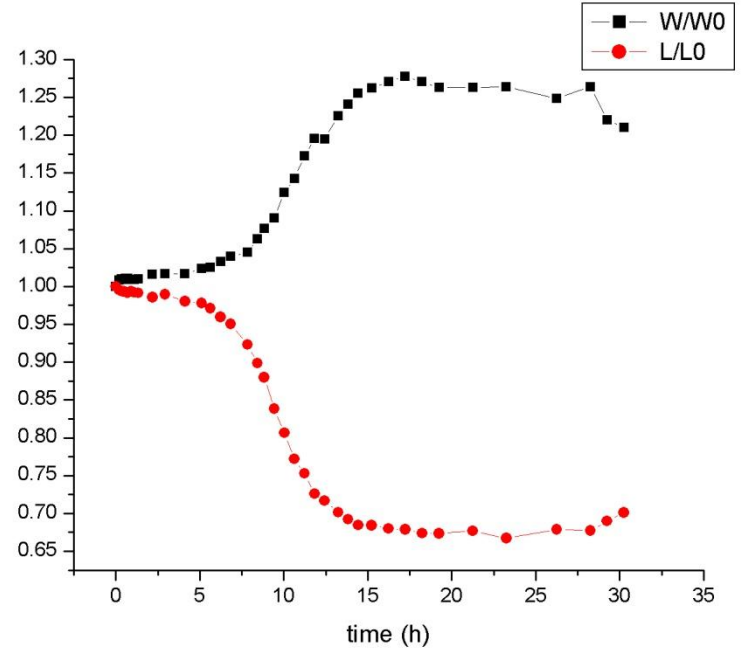
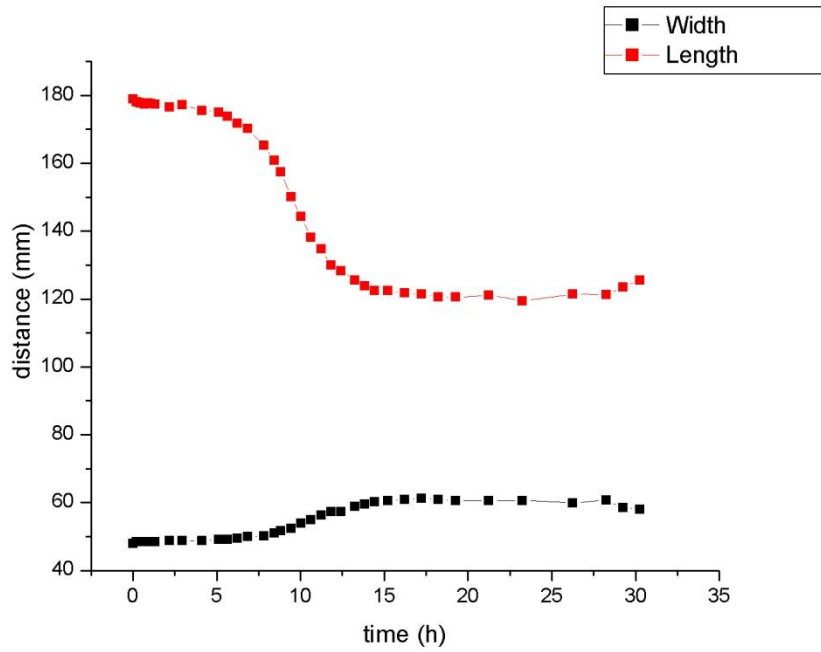
Experimental Setup

We registered the swelling of an elastomer as a function of time in presence of toluene vapor

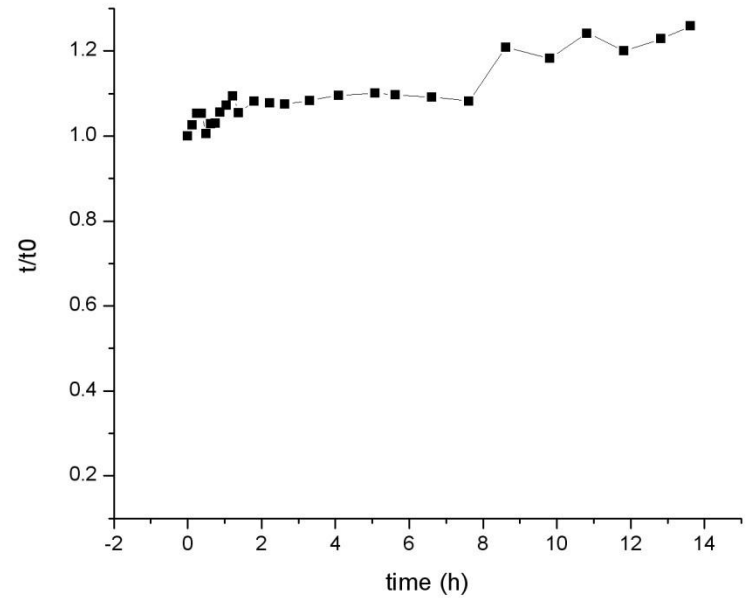
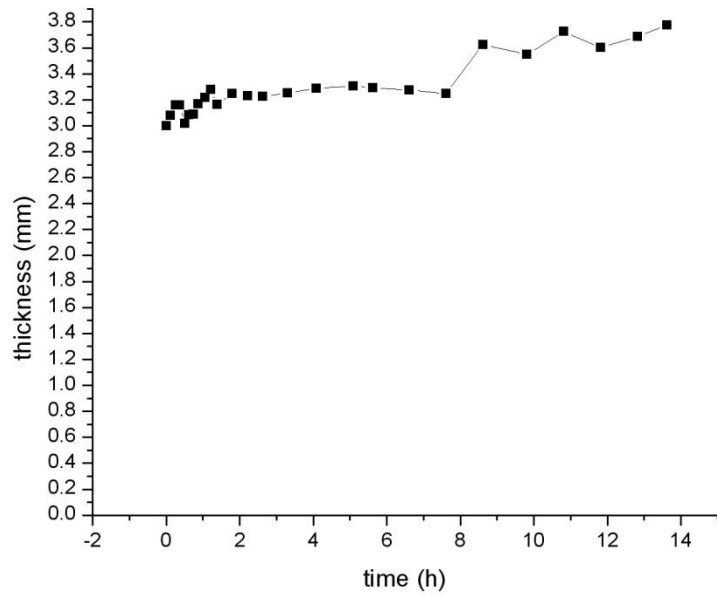
Pictures registered the change in the elastomer sample geometry











Future work



- Apply the studies to elastomers of different geometries.
- Make a more uniform exposure of the elastomer to the toluene vapor
- Study the reaction of a Poly-domain LC elastomer.

Acknowledgment



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- Prof. Peter Palffy-Muhoray

