Calorimetric study of the isotropic-nematic phase transition in liquid crystal side-chain and main-chain elastomers

G. Cordoyiannis[a], B. Rožič[a], H. Finkelmann[b], S. Krause[b], Z. Kutnjak[a], and S. Žumer[c]

a J. Stefan Institute, 1001 Ljubljana, Slovenia, e-mail: Brigita.Rozic@ijs.si
b Institut für Makromolekulare Chemie, Universität Freiburg, Freiburg, Germany
c Faculty of Mathematics and Physics, University of Ljubljana, Ljubljana, Slovenia

A high-resolution calorimetric study of isotropic-nematic phase transition was performe d on liquid single-crystal side-chain and main-chain elastomers with various crosslinks density and different loads during the sample preparation. The density of crosslinks st rongly affects the mean value and the dispersion of local mechanical fields thus leadi ng to the critical point in both systems. At low values of the crosslinks density the f irst order isotropic to nematic phase transitions were found in both systems with sharper transition in the main-chain elastomers than in the side chain elastomers. At critical crosslink s density the predominantly first order thermodynamic response transforms into a pred ominantly supercritical one via a critical point (1,2,3). The heat capacity results in the vicinity of the critical point are consistent with an inherent weakly disordered orientati onal state composed of regions with the temperature profile of the nematic order para meter ranging from first order to supercritical.

References

(1) A. Lebar, Z. Kutnjak, S. Žumer, H. Finkelmann, A. Sanchez-Ferrer, B. Zalar, *Phys. Rev. Lett.* **2005**, 94, 197801.
(2) G. Cordoyiannis, A. Lebar, B. Zalar, S. Žumer, H. Finkelmann, Z. Kutnjak, *Phys. Rev. Lett.* **2007,** 99, 197801.
(3) G. Cordoyiannis, A. Lebar, B. Rožič, B. Zalar, Z. Kutnjak, S. Žumer, F. Brömell, H. Finkelmann, to be published **2009**.