

## Biaxiality and Dynamics in Liquid Crystalline Elastomers

F. Brömmel<sup>a</sup>, W. Stille<sup>b</sup>, A. Hoffmann<sup>a</sup>, H. Finkelmann<sup>a</sup>

*a Institut für Makromolekulare Chemie, Albert-Ludwigs-Universität Freiburg,  
79104, Freiburg, Germany*

*b Physikalisches Institut, Albert-Ludwigs-Universität Freiburg,  
79104, Freiburg, Germany*

We present <sup>2</sup>H-NMR studies on nematic liquid crystalline elastomers which, according to spin-probe measurements, form biaxial mesophases, i.e. exhibit orientational long range order of all of the molecular axes.

The elastomers were prepared using the two-step procedure (1), where a monodomain sample is obtained by mechanical stretching of a weakly crosslinked gel while finishing the crosslinking-process. The major director is thereby fixed in the elastomer network and thus can no longer relax in the field of the NMR magnet.

The temperature dependence of the biaxiality for all elastomers investigated so far suggests that the the formation of the biaxial phase is connected to the glass transition. These results are in good agreement with the observations of Severing et al. on various biaxial nematic polymers (2). Accordingly, the dynamics of the elastomer play a decisive role in the formation of the biaxial phase.

To further investigate this effect, we compare the mesogen dynamics of a nematic side-chain elastomer to that of a similar main-chain elastomer. For this, <sup>2</sup>H-NMR measurements on elastomers with mesogens deuterated at specific positions and dielectric relaxation measurements on a system copolymerised with mesogens carrying cyano groups were combined. First results indicate that the spacer indeed hinders the rotation of the mesogens around their long axis even at temperatures far above the glass transition.

### References

- (1) J. Küpfer, H. Finkelmann, *Makromol. Rapid Commun.* , **1991**,12, 717
- (2) K. Severing, E. Stibal-Fischer, A. Hasenhindl, H. Finkelmann, K. Saalwächter, *J. Phys. Chem B.* **2006**, 110, 15680