Response and Applications 7: 2:25 - 2:45 p.m.

Two-stage volume phase transitions of a side-chain liquid crystalline gel

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We present a mean field theory to describe volume phase transitions of side-chain liquid crystalline (LC) gels dissolved in nematogens. Six different uniaxial nematic phases (N1∥, N1⊥, N2∥, N2⊥, N3∥, N3⊥) are defined by using orientational order parameter *Sm* of side-chain mesogens, *Sb* of backbone chains, and *S*0 of nematogenic solvents inside the gel. We derive the free energy of side-chain LC gels dissolved in nematogenic solvents and calculate the swelling behavior of the gel, the order parameters, and the deformation of the gel as a function of temperature. We find two-stage volume phase transitions, such as the isotropic(I)-N1∥-N3⊥ and the I-N2∥-N3∥, et.al., with changing temperature. These results present new concepts in structures of nematic liquid crystalline elastomers dispersed in nematogenic solvents.

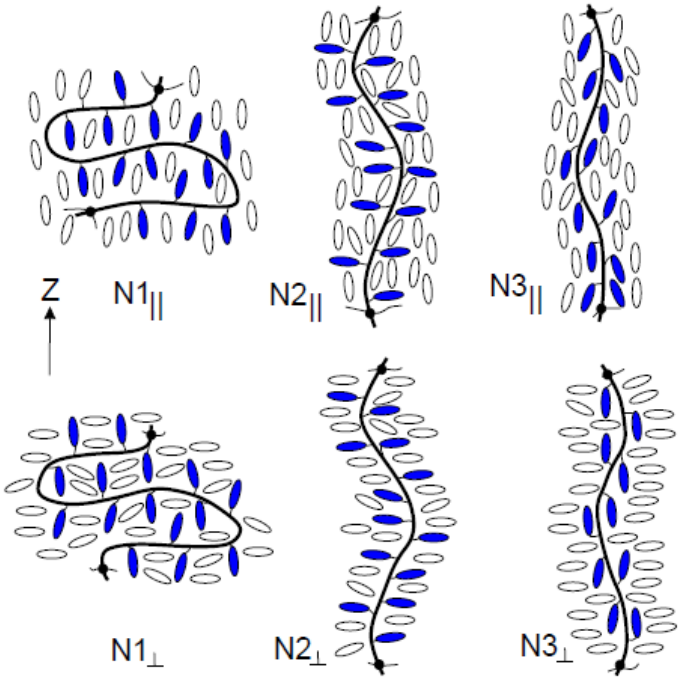

Figure 1: Six uniaxial nematic phases for a side-chain liquid crystalline gel dissolved in nematic solvents.