

Orientational Behavior of the Binary Carbonaceous Mesophase Mixtures under the Extensional Flow

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A Maier-Saupe model for binary mixtures of uniaxial discotic nematogens under extensional flow is formulated to describe phase ordering in carbonaceous mesophases, differing only in molecular weight. The orientational structure and the thermodynamic phase diagram of these liquid crystalline materials depend on (i) the intrinsic properties of the mixture, i.e. molecular weight difference and the interaction parameter, (ii) the operating properties, i.e. concentration and temperature and (iii) deformation rates. The results obtained from our previous study [Golmohammadi et al., L.C., 2009] shows that depending on the intrinsic properties of the system, two types of uniaxial nematic mixtures arise: (i) non-ideal mixtures with a minimum in its Nematic to Isotropic (NI) transition as a function of the concentration, and (ii) ideal mixtures with a monotonic trend of the NI transition temperature as a function of concentration. In the current work we study the effect of extensional flow on the phase transitions in ideal and non-ideal mixtures. Hence the effect of all parameters together, intrinsic properties, operating parameters and the extensional flow, on the orientational structure is obtained. The structural feature is the emergence of biaxiality which is characterized using X-ray scattering calculations as well.