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A Non-linear Model for Rheology of Viscoelastic Immiscible Blends Containing Thermotropic Liquid Crystalline Polymer Undergoing High Deformation Flows

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A new model based on Bousmina's model for non-linear rheology of two viscoelastic immiscible liquids undergoing high deformation flow, was developed to describe the non-linear rheology of the blends containing thermotropic liquid crystalline polymer, TLCP, as a dispersed phase. In order to drive stress tensor based on Batchelor's method for this two phase system, the TLCP was assumed to be an Ericksen's transversely isotropic fluid. The Rapini-Papoular equation of anisotropic interfacial energy was also used for considering the effect of nematic orientation on the interfacial tension. A new anisotropic relaxation rate was introduced to the set of highly non-linear time dependent transport equations in order to take into account the effect of nematic orientation on the relaxation process. The role of the model parameters was studied in both shear and elongational flows. The results predicted from the model were compared with results of Bousmina's model on the basis of experimental results obtained for polypropylene/thermotropic liquid crystalline polymer, PP/TLCP, blend.