

Two-phase micropolar fluids: Phase field models and their analysis

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Micropolar fluids are among the simplest cases of fluids with microstructures, where each fluid particle has its own internal rotations. Examples include ferrofluids, blood flows, bubbly liquids and liquid crystals, all of which play significant and important roles in various industries and also in the human body. Combining the seminal work of A. Cemal Eringen and coworkers, with the diffuse interface approach for multiphase fluid flow, we present some new diffuse interface models for binary mixtures of micropolar fluids that seem to be better amenable to further analysis. Using recent advances in the mathematical analysis of such types of models, we present some new analytical results on existence of weak solutions for a particular diffuse interface model and, if time permits, we will discuss some asymptotic limits. This is a joint work with Kin Shing Chan (Hong Kong Baptist University), Michael Eden (University of Regensburg), Baoli Hao (Illinois Institute of Technology), and Bjorn Stinner (University of Warwick).