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Multi-fluid models of polymeric liquids DOUGLAS TREE, GLENN FREDRICKSON, Univ of California - Santa Barbara — Industrial processes for producing polymer-based materials often operate away from equilibrium, making the final microstructure – and thus the properties of the material – dependent on processing history. Current simulation methods struggle to accurately describe such processes. Traditional fluid dynamics is able to capture transport behavior, but lacks the complex phase behavior characteristic of many polymeric liquids. Coarse-grained particle models can handle the complexity, but are constrained by time and length scales. Consequently, we explore an alternative field-theoretic framework based on the "two-fluid" model originally proposed by Brochard and de Gennes. To demonstrate feasibility, we derive a model and develop an efficient numerical method for a ternary polymer solution. Subsequently, we use this model and method to examine the physics of the immersion precipitation process, used industrially to produce polymer membranes.

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