**Multiscale modeling of non-homogenous flows with non-Newtonian properties** ARTURO FERNANDEZ, Worcester Polytechnic Institute — A new multiscale approach to modeling non-homogenous flows where non-Newtonian effects are significant will be discussed. The computations are carried out by combining an immersed-boundary-method, able to capture the response of non-homogenous systems, with Brownian Dynamics able to predict the local properties. The exchange of information between the continuum-based and Brownian Dynamics models, which capture the system properties at different scales, is done through the velocity gradient and stress state tensors. The stress-state tensor estimated with the Brownian Dynamics simulations is introduced in the solution of the front-tracking method, whereas the velocity gradient state is used to estimate the local properties. How to achieve an adequate computational cost will also be discussed. The methodology is validated for two different problems: (i) the deformation of a Newtonian drop immersed in a simple shear flow and suspended in a viscoelastic fluid; (ii) the buoyancy of air bubbles in a viscoelastic fluid.

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