Homogenization methods for multi-phase mixtures with phase transition

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We consider particles in fluids, such as droplets, bubbles, or solids, and other multi-phase mixture flows. It is common to study mixture conservation laws for such flows. This valid e.g. when considering a scale of observation much larger than the particles. In these models each phase is considered to be present with a mass fraction in space. Some recent models under consideration are due to Baer and Nuntiato as well as Abgrall and Saurel. Also the textbook of Drew and Passman gives an introduction to some of the methods. In the current investigation we are extending these types of models to the case of phase transition on the surface of particles, e.g. water droplets in water vapor or vapor bubbles in water. The homogenization is achieved by sliding averages, not by periodicity assumptions. For the homogenization we are using a number of simplifying assumptions as a first step. We are assuming a continuum carrier phase surrounding ball shaped particles. For the carrier phase we take a potential flow. The particles are treated to be even more simple. This method for mixtures without phase transitions is due to Voinov and Petrov in 1975. Some details were worked out in a diploma thesis of Rydzewski about 15 years ago. The talk will give an introduction to the method and first results that were obtained towards modeling phase transitions.

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