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A computational model for heat and mass transfer across interfaces in two-phase flows using phase field methods[1] SHAHAB MIRJALILI, SUHAS S JAIN, ALI MANI, Stanford University — Two-phase flows involving interfacial heat/mass transfer are widespread in industrial and environmental applications such as chemical reactors, bubbly flows, combustion, boiling, carbon sequestration and ocean-atmosphere exchanges. Thus, it is important to accurately predict the interfacial transfer of heat/mass via numerical simulations. Modeling the interfacial transfer between the two-phases is particularly challenging for phase field (diffuse interface) methods. In the context of these methods, by assuming a micro-structure that is consistent with the interfacial profile, we use perturbation theory and asymptotic analysis of thin films to derive interfacial heat/mass exchange terms that are consistent extensions of the underlying phase field equations. The developed model is conservative and correctly predicts the transient and equilibrium solutions in all limits of diffusivity ratio. Canonical and realistic simulations are presented to demonstrate the consistency, accuracy and convergence of the model.

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