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Modeling scalar transport in two-phase flows with a diffuse-interface method[1] SUHAS S JAIN, ALI MANI, Center for Turbulence Research, Stanford University, USA, CENTER FOR TURBULENCE RESEARCH TEAM — Transport of scalar quantities in two-phase flows is an important problem that finds applications in wide range of natural phenomena and industrial processes. In a wide range of applications transport coefficients on the two sides of the interface can be drastically different resulting in an effective confinement of the scalar in one of the phases in the time scales of interest. This results in the formation of sharp gradients in the scalar concentration at the interface, which is a numerically challenging problem to simulate. To overcome this challenge, we developed a novel transport model (Jain & Mani, *CTR Annual Research Briefs*, 2019) for the simulation of scalar quantities in two-phase flows with a conservative diffuse-interface method. The provable strengths of the model are that: (a) it maintains the positivity property of the scalar concentration field despite using the central-difference scheme, (b) the transport of the scalar field is consistent with the transport of the volume fraction field, and therefore, prevents the artificial leakage of the scalar across the interface. We present numerical simulations using the proposed model in a wide range of two-phase flow regimes, spanning laminar to turbulent flows.

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