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Compositional interface dynamics within symmetric and asymmetric planar lipid bilayer membranes[1] TAO HAN, MIKKO HAATAJA, Department of Mechanical and Aerospace Engineering, Princeton University, Princeton NJ 08544 — Compositional domains within multicomponent lipid bilayer membranes are believed to facilitate many important cellular processes. In this work, we will first develop a general model of planar lipid bilayer membrane within a phase field framework, which includes not only advective and diffusive lipid transport mechanism, but also incorporates an asymmetry between the lipid compositions and thermodynamic behavior between the two leaflets, as well as an intermonolayer thermodynamic coupling and friction effects. Then, we will derive the general equations that describe the dynamics of compositional domains within planar membranes with asymmetry in leaflet properties and in the presence of a thermodynamic coupling between the leaflets. These equations are then employed to develop analytical solutions to the dynamics of the recurrence of registration for circular domains in the case of weak coupling. The validity of the analytical solutions is established by a direct comparison between the predicted dynamics and those obtained from numerical simulations of the the phase-field model.

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