

Fractional Phase-Field Models

$$\phi_t + (\mathbf{u} \cdot \nabla)\phi = \gamma(\nabla^{2s}\phi - f(\phi)),$$

$$\rho(\phi) = \frac{\rho_1 - \rho_2}{2}\phi + \frac{\rho_1 + \rho_2}{2}, \quad \mu(\phi) = \frac{\mu_1 - \mu_2}{2}\phi + \frac{\mu_1 + \mu_2}{2},$$

$$\rho(\mathbf{u}_t + (\mathbf{u} \cdot \nabla)\mathbf{u}) = \nabla \cdot \mu D(\mathbf{u}) - \nabla \Pi - \lambda(\phi_t + \mathbf{u} \cdot \nabla \phi)\nabla \phi,$$

$$\nabla \cdot \mathbf{u} = 0.$$

$$D^{2s} = \frac{1}{2}(D_x^s D_x^s + {}_x D^s {}_x D^s + D_y^s D_y^s + {}_y D^s {}_y D^s),$$

