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Cascades and Spectra of Elastic Turbulence in 2D: Spinodal Decomposition MHD[1] XIANG FAN, PATRICK DIAMOND, Univ of California - San Diego, LUIS CHACON, Los Alamos National Laboratory — We report on studies of turbulence in 2D spinodal decompositions of symmetric binary mixtures. This study emphasizes a comparison and contrast of the physics of spinodal turbulence with that of 2D MHD turbulence. The important similarities include basic equations, ideal quadratic conserved quantities, cascade directions and elastic waves. Turbulence in spinodal decomposition exhibits an elastic range when the Hinze scale is sufficiently larger than the dissipation scale, i.e. $L_H \ll L_d$. We show, using direct numerical simulation, that the mean square concentration spectrum $H_k^{\psi} \equiv \langle \psi^2 \rangle_k$ (analogous to $H_k^A \equiv \langle A^2 \rangle_k$ in MHD) scales as $k^{7/3}$. This suggests an inverse cascade of H^{ψ}, corresponding to the case in MHD. However, we also show that, the kinetic energy spectrum scales as k^3, as in the direct enstrophy cascade range for a 2D fluid (not MHD!). The resolution of this dilemma is that capillarity acts only at blob boundaries. This is in contrast to B in MHD. Thus, as blob merger progresses, the packing fraction of interfaces decreases, thus explaining the outcome for the kinetic energy spectrum.

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