Magnetohydrodynamic Stability of Two Streaming Superposed Viscoelastic Conducting Fluids

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The stability of the plane interface separating two Oldroydian viscoelastic superposed moving fluids of uniform densities when immersed in a uniform horizontal magnetic field has been investigated. The stability analysis has been carried out, for mathematical simplicity, for two highly viscous fluids of equal kinematic viscosities. It is found that the potentially stable configuration remains stable if the fluids are at rest, while it becomes unstable if the fluids move. The stability criterion is found to be independent of the viscosity and viscoelasticity, and to be dependent on the orientation of the magnetic field and the magnitudes of the fluids and Alfvén velocities. It is also found that the potentially unstable configuration remains unstable in the absence of average fluid velocities, or in the presence of fluid velocities and absence of a magnetic field. The magnetic field is found to stabilize a certain wavenumbers range of the unstable configuration even in the presence of the effects of viscoelasticity. The behaviour of growth rates with respect to the stress relaxation time, strain retardation time, fluid and Alfvén velocity parameters is examined analytically, and the stability conditions are obtained and discussed. – Pacs: 47.20.-k; 47.50.+d; 47.65.+a.

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