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Electrohydrodynamic linear stability of two immiscible fluids in channel flow under the influence of a parallel electric field A. KEREM UGUZ, Carnegie Mellon University, Mechanical Engineering Department, Pittsburgh, PA, 15213, NADINE AUBRY, Carnegie Mellon University, Mechanical Engineering Department — The instability of a flat interface between two viscous, immiscible and incompressible liquids in plane Poiseuille flow is studied in the presence of an electric field parallel to the flat interface. In practice, either the stability or instability of the interface is desired depending on the application such as material deposition, mixing, or droplet formation. For that purpose the effect of various parameters was studied via linear stability analysis. The electric field was found to be either stabilizing or destabilizing depending on the electrical properties of the fluids. An interesting feature of this problem is the presence of a second window of stability, namely for some parameters there exist two regions of wavenumbers in which the system is stable. Our results are compared with the case where the electric field is normal to the fluid-fluid interface [1, 2].

[1] O. Ozen, N. Aubry, D. T. Papageorgiou and P. G. Petropoulos, Electrochimica Acta, **51**, 5316-5323 (2006)

[2] F. Li, O. Ozen, N. Aubry, D.T. Papageorgiou and P.G. Petropoulos, Journal of Fluid Mechanics, **583**, 347-377 (2007)

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