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Linear and nonlinear stability of a two-fluid interface in channel flow under the influence of parallel and normal electric fields KEREM UGUZ, OZGUR OZEN, NADINE AUBRY, Carnegie Mellon University, Mechanical Engineering Department — The use of an electric field on a two-fluid interface has been shown to be an efficient way to trigger an interfacial instability which, in turn, can enhance mixing or lead to droplet formation in a microfluidic channel. Keeping the latter applications in mind, the instability of a flat interface between two liquids confined in a channel and subjected to Poiseuille flow is studied in the presence of an electric field either parallel or normal to the flat interface. The liquids are considered to be viscous, incompressible and leaky dielectric. We have analyzed the effect of various parameters, as well as compared the role played by a parallel versus normal electric field on the dispersion curve, i.e., the growth rate as a function of wavenumber. While the flow is found to have no direct effect on the linear stability of the interface, its effect can be clearly observed in the nonlinear regime.

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