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Electrohydrodynamic Instability of the Interface between Two Fluids in Channel Flow OZGUR OZEN, NADINE AUBRY, PETER PETROPOULOS, DEMETRIUS PAPAGEORGIOU, New Jersey Institute of Technology — The stability of two-fluid flow in a channel is of importance in the design of microfluidic systems. Due to the low Reynolds numbers, it is relatively difficult to attain mixing in micro-channels. Recent studies using miscible fluids have shown that applying electric fields enhances mixing over a short distance in short times. However, in a large class of applications, the fluids in contact are not miscible, and the interfacial tension stabilizes the interface, an effect absent in the physics of miscible fluids. We have carried out the linear stability analysis of the two-fluid flow in a channel subject to an electric field normal to the interface between the fluids using the Chebyshev Spectral tau method. Moreover, we have derived a coupled system of evolution equations for the interface position and the charge density at the interface. We will present the numerical results of the long wave analysis and discuss the effect of different physical parameters on the electrohydrodynamic instability of the interface. A comparison between the theoretical results and experiments will be given.

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