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Electrokinetic Instability in Plane Poiseuille Flow LUKAS VERMACH, Cambridge Centre for Analysis, University of Cambridge, C.P. CAULFIELD, BP Institute & DAMTP, University of Cambridge — We consider the linear stability of the flow of an electrically charged liquid driven by a constant pressure gradient through a plane channel with charged walls. The flow is modified by the establishment of electric double layers in the near-wall regions. Chakraborty & Das (2008 *Phys. Rev. E.* **77** 037303) introduced an extended theoretical model of the associated electroviscous effects, including the streaming field contribution produced as a result of the downstream motion of the charge carriers. We use this model to examine the impact of the streaming field on the background plane Poiseuille flow profile and hence the linear stability of the flow. We find that, under certain realistic circumstances involving sufficiently large surface potential, the streaming field strongly modifies the background flow, inducing inflection points in the velocity profile and near-wall reverse flow. We show that the critical Reynolds numbers for linear instability of such flows are independent of Péclet number, and can be substantially suppressed below that of the uncharged classical parabolic flow profile.

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