Electro-hydrodynamic instability in a microchannel between a Newtonian and a non-Newtonian liquid

- BIFD 2011 -

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ABSTRACT

To avoid employing complex geometries, the effect of the electric field on the stability of two liquids flowing in a microchannel has been investigated for either rapid mixing or generating droplets in the case of miscible or immiscible liquids, respectively. It has been shown both theoretically and experimentally that using an electric field is an efficient method. In this study, the liquids, subjected to Poiseuille flow, are assumed to be immiscible and leaky dielectric. However, one of the liquid is assumed to obey UCM constitutive equation. The effect of the electric field on the dispersion curves is presented for various physical parameters and a detailed study is performed to understand the influence of the non-Newtonian behavior via Weissenberg number.