Non-linear dynamics of viscoelastic liquid trilayers subjected to an electric field[1] GEORGE KARAPETSAS, VASILIS BONTOZOGLOU, University of Thessaly — The scope of this work is to investigate the non-linear dynamics of the electro-hydrodynamic instability of a trilayer of immiscible liquids. We consider the case of a polymer film which is separated from the top electrode by two viscous fluids. We develop a computational model and carry out 2D numerical simulations fully accounting for the flow and electric field in all phases. For the numerical solution of the governing equations we employ the mixed finite element method combined with a quasi-elliptic mesh generation scheme which is capable of following the large deformations of the liquid-liquid interface. We model the viscoelastic behavior using the Phan-Thien and Tanner (PTT) constitutive equation taking fully into account the non-linear elastic effects as well as a varying shear and extensional viscosity. We perform a thorough parametric study and investigate the influence of the electric properties of fluids, applied voltage and various rheological parameters.

George Karapetsas
University of Thessaly