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Interfacial Instabilites in Two-Layer Flows of Viscoelastic Fluids¹ UMA BALAKRISHNAN, SVETLANA SUSHCHIKH, THEO THEOFANOUS, UCSB — We consider interfacial instability of pressure-driven, two-layer flows with one of the fluids being viscoelastic (like a polymeric solution or a polymer melt). We build on the work of Ganpule and Khomami (JNNFM, v.81, pp.27-69, 1999) by including finite extensibility in a complete way (as appropriate for the strong elongational flows that drive our present interest), and by extending the parameter space considered by them. While from the complete model they find only a Yih mode, and while by matching viscosities they find an elastic mode, we find the simultaneous existence of both modes. The parameter space for this occurrence is a subset of conditions from 1 < De < 5, 5 < n < 30, k > 4.5, and viscoelastic layer thicknesses less than the Newtonian one (less viscous). In the above, n is the viscosity ratio (solution divided by the solvent) and k is the wave number. For Re >40, the elastic mode disappears, and the shear (T-S) becomes dominant mode.

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