

Abstract Submitted  
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**Stability Studies of Three-layer Hele-Shaw Flows** PRABIR

DARIPA, Texas A&M University — The stability of three-layer Hele-Shaw flows with middle layer having either constant or variable viscosity will be considered in this talk. We solve this problem for the case of constant viscosity exactly and obtain several results all of which are independent of the length of the middle layer: (i) a necessary and sufficient condition for instability of any mode with the wave-number (ii) a critical viscosity of the middle layer that gives the shortest bandwidth of unstable modes; and (iii) an upper bound on the growth rate of instabilities. Numerical evidence that supports the effectiveness of the upper bound is also presented. We also consider the case of variable viscosity in the middle layer and provide results on the upper bound of the growth rate of disturbances. Time permitting, we will also provide results on the growth rates in the presence of diffusion when the variable viscosity of the middle layer is due to varying polymer concentration. In particular, we will show analytically stabilizing effects of large enough diffusion.

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