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Stability Results on Multi-Layer Hele-Shaw Flows PRABIR DARIPA, Texas A&M University — The upper bound results on the growth rates in unstable multi-layer Hele-Shaw flows will be derived. The cases treated are constant viscosity layers and variable viscosity layers. The upper bound provides a way to assess cumulative effects of many layers and many interfaces on the growth rates of unstable waves. As an application of the bound, we obtain some sufficient conditions for suppressing instability of two-layer flows by introducing arbitrary number of constant viscosity fluid layers in between. This sufficient condition has very practical relevance because it narrows the choice of internal layer fluids based on surface tensions of all interfaces and viscosities of fluids. Importance of this condition which has been hitherto unknown is also discussed. Other consequences of these upper bounds and sufficient conditions are discussed. The case of internal fluid layers having unstable viscous profiles is also treated for three-layer and four-layer flows only. Implications of these stability results for these various multi-layer flows are discussed and compared from practical standpoint.

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