INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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A surface tension gradient resulting from the inhomogeneities in temperature (thermo-capillarity) or concentration (solutocapillarity) on the free surface of a pure or binary liquid has the ability to induce motion in its bulk phase. Typically known as the Marangoni instability, this phenomenon is frequently encountered in the small-scale systems (liquid films, droplets, liquid bridges etc.) where the surface effects dominate over the volumetric ones. The present thesis aims at understanding this instability phenomenon for thin films of Newtonian and viscoelastic liquids under the framework of liner stability analysis. The dynamics of both the long-wave and short-wave perturbations are studied here for the most classical system configuration of a thin liquid film confined between its free surface and a poorly conducting rigid substrate. Besides exploring the basic instability modes for both the Newtonian and viscoelastic fluids, the physical conditions are also identified for which these instability modes become dominant in the system. Several novel instability modes are detected in this work that forms a strong basis for the future course investigation in such fluids.