

Dynamics of Circular Contact Lines

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Spin coating is one of the most important fabrication processes used in the microelectronics industry. The final aim in spin coating is to create a very thin and uniform layer of photo-resist (generally a polymer dissolved in some solvent), onto a silicon wafer. It is undesirable to have any fingering instabilities, or non-uniformities in the deposited layer. At the same, it is also important to understand the basic physical mechanisms which govern the final fluid thickness and the growth of these instabilities. This talk will be devoted to an experimental study of the process of thinning of a fluid layer under the action of centrifugal and Marangoni (created by a thermal gradient) forces. We shall look at two variations of the problem – in one case, we look at the evolution of a single drop of fluid placed at the center and subjected to centrifugal and Marangoni forces. Alternatively, we can start with a thick layer of fluid, and observe the thinning process under the action of centrifugal and Marangoni forces. The evolution of the thinning film will be analyzed in the framework of lubrication theory and extensions to the case of complex and critical fluids discussed.