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Shear and Pressure Driven Flow in Microchannels YOGESH JALURIA, Rutgers University — In many important circumstances, microchannel flows driven by moving surfaces that impart shear to the fluid and by an imposed pressure difference across the channel are of interest. The pressure may aid or oppose the flow due to the moving surface. One such problem is the optical fiber coating process, where the entrance of the moving fiber into a reservoir of fluid, as well as its exit, results in shear driven flow in microchannels. An additional aiding or opposing pressure head is also usually applied. The transport processes influence the resulting coating very substantially. This paper discusses the basic considerations that arise in such processes, particularly the resulting flow and the menisci that are observed at the inlet and outlet regions of the two microchannels. Visualization has been an important approach to the basic understanding of these flows. Detailed flow and thermal transport results are often obtained by numerical modeling. Another important circumstance is the pressure rise in the channel for narrowing flow domains, such as those employed in dies and extruders. It is found that, in practical problems, high pressures are generated that oppose the shear effects. Then the resulting transport is affected by both shear and pressure. On the other hand, cooling of electronic systems often employs pressure-driven microchannel flows. Comparisons between the results obtained for these different flow situations indicate many interesting features, which are discussed in terms of the basic mechanisms.

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