

Flow Instabilities and Coating Windows of Coating Processes

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The final goal of coating processes is to produce uniform coating liquid layer with the specified thickness at high speeds. However, manufacturing uniform coating products is not a trivial task at high-speed operations because various flow instabilities or defects such as leaking, bubbles, ribbing, and rivulets are frequently observed in coating processes. It is no wonder, therefore, that many efforts to elucidate the various aspects of dynamics and coating windows in coating processes have been made both in academia and industry. Recent research results related to flow dynamics and defects/instabilities in various coating flows/processes have been briefly reviewed in this talk. We will explain some theoretical results in curtain and slot coatings by the 1D simplified viscocapillary models, Flow-3D/Fluent, and 2D FEM with auto-remeshing technique. Also, as experimental results using coating equipment, flow visualization near coating beads and coating windows for Newtonian and polymer solutions in forward and reverse roll coatings and slot coating will be presented.