

Dynamics and flow instabilities in rigid/deformable roll coating processes

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The roll coating is widely used in the industrial field, e.g. Cr-free steel coating, because it is capable of continuously manufacturing coating products with high speeds. Forward roll coating system with rigid and deformable rolls has been considered in this study, where coating liquids is metered in the nip region between two co-rotating rolls. Using the deformable rolls makes it possible to effectively produce ultra-thin coated film which is not significantly sensitive to coating gap. There have been not so much research reports on this process, despite aforementioned industrial importance. Therefore, how the rheological properties of coating liquids, e.g., viscoelasticity, affects the stability and the dynamics of the rigid and deformable roll coating processes is focused in this study. Effects of various process conditions such as softness of deformable rolls, coating gap, and nip pressure on coating dynamics have been examined. And also, stability windows demarcating stable and unstable ribbing regimes for different coating liquids have been established and compared.