

Low-flow Limits in Slot Coating with Apparent Pinning Effect and No Recirculation

T. Matsuda(*) ,S. Kumar, L. F. Francis(**) and M. S. Carvalho(***)

(*)Lintec Corporation
Warabi-shi, Saitama 3350005 Japan

(**)Department of Chemical Engineering & Material Science,
University of Minnesota, MN 55455 USA

(***)Department of Mechanical Engineering,
Pontificia Universidad Catholica, 22453 Brazil

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Slot coating is one of the most common methods in the coating industry because it has many advantages such as highly precise coating and low contamination. For optical device use, thin film coating is has been of much interest recently. The ratio of coating gap to minimum film thickness at a given line speed or the maximum line speed at a given ratio of coating gap to film thickness are called low-flow limits.

In actual coating, die edges are rounded and contact lines do not pin, thus contact lines move along the die edge, which has a given curvature. If the mobility of the contact line is small, there is an apparent pinning effect which is strong. In addition, flow recirculation in the coating bead should be avoided because it may cause defects, especially for particle coating. In this study, a new map for thin film coating which considers the apparent pinning effect at the die edge and no recirculation is proposed. The dependence on operating parameters of the coating process is calculated with the Galerkin-FEM method.

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