

Streak Formation in Three-Layer Films on an Inclined Plane: Experimental Verification

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Joos¹ presented a model for the evolution of streaks with stratified viscosity and insoluble surfactant on an inclined plane, the inclined plane being representative of the slide of a coating die that coats multiple layers simultaneously. Joos and Devine² presented experimental verification of the model for two-layer films for streaks caused by two disturbances: (1) steady seepage of liquid into the bottom layer from the wall of the slide, and (2) topographical nonuniformity in the slide, such as produced by a particle adhering to the slide surface. In this presentation, we will present experimental data using the steady seepage disturbance and compare the results of an extension of the model³ to the more generalized case of three-layer films. Experimental results will be presented for a variety of situations, including:

- The effect of stratified viscosities above a bottom-layer streak
- Transfer of streaks to layers other than the layer in which the streak originates
- Incomplete leveling of the streak on a slide element
- Evolution of the streak in a film after its application to a substrate

In all cases, agreement between the model and the experiment is very good, indicating that the model predicts streak flow reliably under a broad variety of circumstances.

¹ Joos, F. M., 1997, "Evolution of streaks in liquid films with stratified viscosity and insoluble surfactant flowing down inclined plates," *Fluid Mechanics of Coating Processes-ECS-97 Proceeding*, Editor Bourgin, pp. 267-276, Strasbourg.

² Joos, F. M. and Devine, W. D., 2003, "Streak formation in films of multiple layers on inclined plates," 5th European Coating Symposium 2003, Fribourg.

³ Joos, F. M. and Devine, W. D., 2004, "Streak formation in multiple-layer films on an inclined plane: highlights of the analysis," Paper to be submitted: 12th International Society of Coating Science and Technology Symposium, Rochester.