

Simultaneous Multilayer Coating of Miscible Solutions

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Slot-die coating is one of the most common methods for making accurate, uniform, and thin liquid layers, and many manufacturers in several fields are now using this process to make their products. However, in recent years requirements for highly functional and low-cost films are increasing, and it is becoming hard to meet these requirements by single-layer coating. To address this issue, the focus of our research is on simultaneous multilayer slot-die coating.

Multilayer slot-die coating has been studied in many laboratories, and the operating conditions and solution properties that are required to avoid various coating defects have been reported in recent years. However, in these past studies, the same solvents were used for all layers, and diffusion of solvents between layers was not addressed. In general, the main purpose of multilayer coating is to add extra functions to products at a low cost, requiring each layer to be made from a different solution. If there is diffusion between layers, multilayer films cannot achieve their desired functions. So, being able to describe the influence of diffusion between layers is an important consideration.

In this work, we use water-based and alcohol-based solutions for each layer, and both of them are coated as a two-layer flow on a plastic web from a slot die simultaneously. After coating two layers, characteristic dewetting behavior is observed, and found to be dependent on the coating thickness and the surface tension of each layer. We will present the experimental results and our interpretation of this phenomenon.

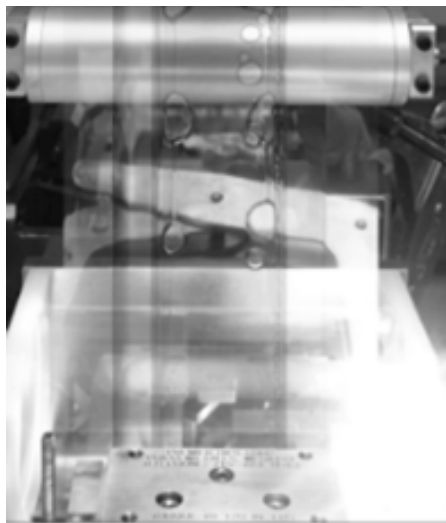


Figure 1. Dewetting behavior