Patch Coating: Analysis of flow shutdown process

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Coating of discrete patches onto a moving substrate is becoming more common as a variety of new products are developed, ranging from adhesives, pharmaceutical patches, batteries and fuel cell membranes. Coating individual discrete shapes can reduce waste that comes from converting processes and can provide desired functionality, such as in the case of anode and cathode thin-film lithium batteries, at which the uncoated boundary is needed to prevent short circuit.

For coating rectangular patches, intermittent slot die coating is the preferred method. Machine-direction dry lanes can be obtained by blocking the feed slot with internal inserts, diverting the liquid flow away from these lanes. Cross-web dry lanes can be obtained by starting and stopping the flow out of the coating die. Controlling the flow start-up and shutdown to produce sharp and uniform leading and trailing edges is very challenging.

In this work, we analyze the flow shutdown process and how the operating conditions, die geometry and liquid properties affect the trailing edge of the coated patch. The results show that the uniformity of the coating boundary can be optimized by changing the die shoulder angle and wetting characteristics.