

Effect of Substrate Contact Angle on Ink Transfer in Flexographic Printing

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Abstract

Flexography is a roll-based mass printing process used in manufacture of printed products such as sensors, self-cleaning surfaces, and flexible electronics. Flexography involves inking of a stamp wrapped around a roller, and the transfer of ink on the stamp surface to a printing substrate as the roller rotates against it (Figure 1).

Ink transfer ratio from the stamp surface to the printing substrate is an important parameter of the system, as it determines printing quality and the thickness of the printed product. This study aims to examine through simulations the effect of stamp and substrate surface energies, ink properties, and substrate speed on the ink transfer ratio using the Moving Mesh interface, and the Laminar Two-Phase Flow, Phase Field interface in the Microfluidics Module of COMSOL® software.

In the simulations, stamp and substrate surfaces are approximated as two flat surfaces (Figure 2a). The surfaces are set stationary as an ink droplet placed between them reaches its equilibrium shape and then the substrate surface is set into motion until the ink splits into two (Figure 2b).

Work is in progress to obtain simulation results consistent with the literature (ink left on each surface is dependent on the ratio of their surface energies) and to examine the change in ink fraction transferred to the printing substrate as a function of ink properties and substrate speed.

Figures used in the abstract

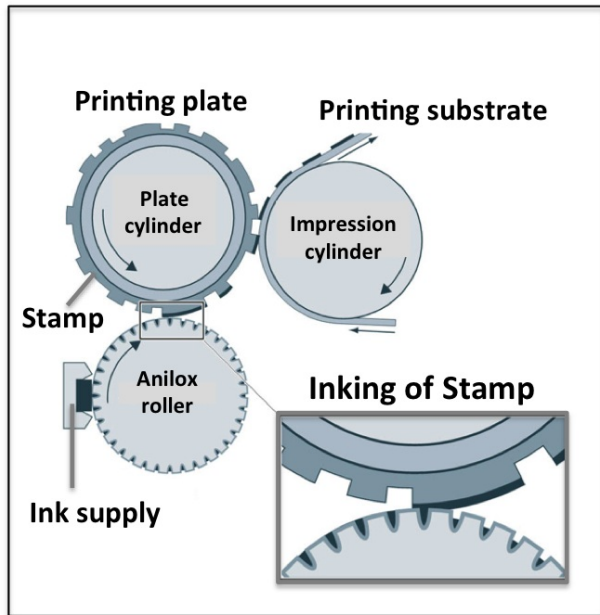


Figure 1

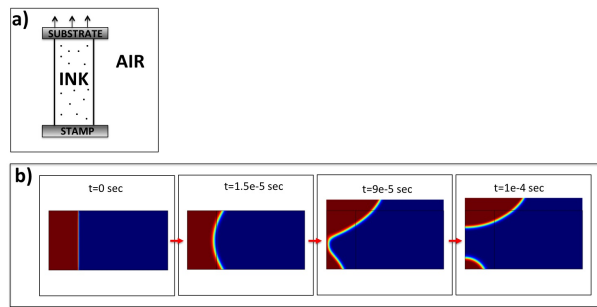


Figure 2