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Inkjet printing lines onto thin, moving porous media - experiments

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Inkjet printing consists of the ejection and deposition of ink droplets on substrates that are moving underneath the printhead [1]. For printing on paper, water-based inks have been developed that are beneficial from an environmental standpoint. The printing of semi-infinite lines on moving paper substrates lead to a steady-state distribution of moisture and heat, which are a suitable way to study the interplay between heat and mass-transfer. Lateral wicking and evaporative mass loss are the dominant mass transfer mechanisms, while evaporative cooling reduces the temperature of paper by up to 6K.

Our goals were to develop an experimental setup and procedure to systematically measure the moisture content and temperature of paper as functions of the speed of the motion of the substrate and the frequency of droplet deposition. We use light transmission imaging and infrared thermography to measure the moisture content and temperature distributions, respectively. Our experimental setup consists of a sheet of paper, mounted 10 mm above an area light source and fastened onto a motorized translation stage. An inkjet printhead is placed a few mm above the paper surface. A CCD and an IR camera measure the transmitted intensity and the temperature of paper, respectively.

Besides conducting systematic experiments, we also developed a theoretical model for heat and mass transfer including evaporative cooling. The results of our simulations agree well with the measured data. Details of the model will be introduced in a separate presentation.

[1] H. Wijshoff, Physics Reports 491, 77-177 (2010).

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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