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Transport and Deposit Structure for Particle-laden Binary Rivulets[1] AREF GHAFOURI, TIMOTHY SINGLER, XIN YONG, PAUL CHIAROT, Binghamton University — We report on the use of inkjet printing to produce rivulets of particle-laden water-alcohol binary solutions. Our goal was to elucidate the transport and deposit structure of the particles dispersed in the rivulet for varying alcohol content. The rivulets were printed on glass substrates that were chemically treated to ensure the contact line remained pinned during evaporation, which inhibited the breakup of the rivulet due to the Rayleigh-Plateau instability. Fluorescent nanoparticles were used as tracers to reveal the flow field during and after inkjet printing. For pure aqueous solutions, only an axially-directed flow was established along the rivulet. The addition of ethanol to the ink induced a strong Marangoni effect in the transverse direction during evaporation. When combined with the axial flow, this solutal Marangoni convection produced a helically-shaped flow along the axis of the rivulet. The significantly lower surface tension of ethanol compared to water also caused a decrease in the contact angle, which increased the wetted area of the rivulet and further altered the particle transport and deposit structure.

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