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**Shear Flow Instabilities and Droplet Size Effects on Aerosol Jet Printing Resolution** GUANG CHEN, Univ of Maryland-College Park, YUAN GU, Univ of Maryland-College Park and The Laboratory for Physical Science, DANIEL HINES, The Laboratory for Physical Science, SIDDHARTHA DAS, Univ of Maryland-College Park, THE LABORATORY FOR PHYSICAL SCIENCE COLLABORATION, SOFT MATTER, INTERFACES, AND ENERGY LABORATORY COLLABORATION — Aerosol Jet printing (AJP) is an additive technology utilizing aerodynamic focusing to produce fine feature down to 10 micrometers that can be used in the manufacture of wearable electronics and biosensors. The main concern of the current technology is related to unstable printing resolution, which is usually assessed by effective line width, edge smoothness, overspray and connectivity. In this work, we perform a 3D CFD model to study the aerodynamic instabilities induced by the annular shear flow (sheath gas flow or ShGF) trapped with the aerosol jet (carried gas flow or CGF) with ink droplets. Extensive experiments on line morphology have shown that by increasing ShGF, one can first obtain thinner line width, and then massive overspray is witnessed at very large ShGF/ CGF ratio. Besides the fact that shear-layer instabilities usually trigger eddy currents at comparatively low Reynolds number  600, the tolerance of deposition components assembling will also propagate large offsets of the deposited feather. We also carried out detailed analysis on droplet size and deposition range on the printing resolution. This study is intended to come up with a solution on controlling the operating parameters for finer printed features, and offer an improvement strategy on next generation.

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