Abstract Submitted
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Electrostatically-Assisted Direct Ink Writing for Additive Man-
ufacturing JEVON PLOG, University of Illinois at Chicago — While nozzle-based
printing is already arguably versatile, such sub-categories as Direct-Ink-Writing
(DIW) are difficult to be used to print materials on rough surfaces. Recently electro-
hydrodynamic (EHD) elements added new features in droplet positioning but also
revealed limitations in the achievable build height due to the need for a grounded
substrate or embedded electrode. Here, we introduce an additional electrode added
to the printhead generating an electric field between the above-mentioned electrode
and printing nozzle. The resulting Coulomb force pulls the extruded ink in the
direction of printing allowing faster translational speed, thinner trace widths, and
improved deposition on rough surfaces without a decrease in build height. We also
developed the electrohydrodynamic theory of the proposed DIW processes. The in-
tegration of the electrode to the printhead allowed successful prints at the machine’s
maximum speed of 500 mm/s for a documented situation in which DIW previously
failed in existing literature (also, on rough surfaces where printing was impossible
before). Along with new design opportunities, these results unlock speed restriction
within nozzle-based printing while significantly expanding versatility and substrate
choices.

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