

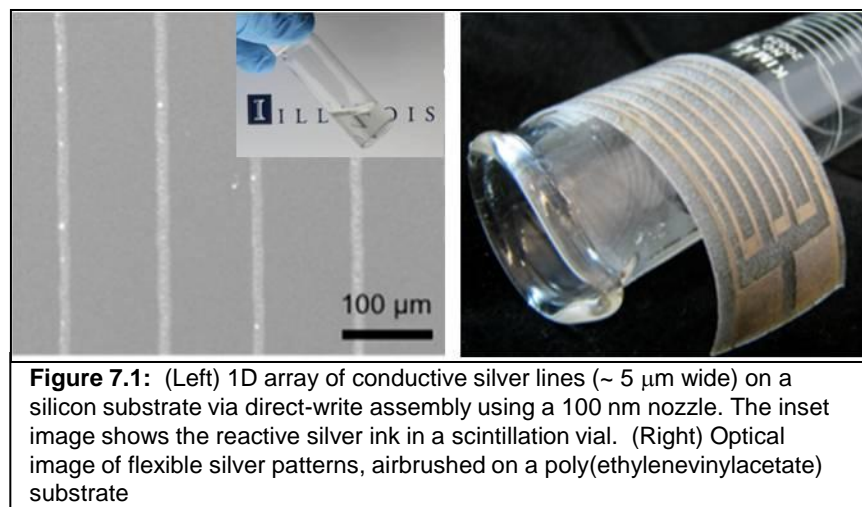


# Designing Functional Inks for Directed Materials Assembly

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Recent advances in printed electronics by direct-write assembly of functional inks open new avenues for microscale patterning of conductive features, solar cell interconnects, and cathode/anode for microbatteries. We have developed a new class of silver-based reactive solution inks that are suitable for printing approaches, e.g. direct ink writing, inkjet, aerosol jet, and airbrush printing. These inks are devoid of particles and, hence, readily flow through ultrafine nozzles without clogging. We have demonstrated conductive silver traces ( $\sim 5\text{ }\mu\text{m}$  wide) using direct ink writing coupled with a flexible, nanoscale nozzle (100 nm in diameter) on silicon substrates, and flexible silver patterns using airbrushing on polymer substrates. Upon annealing at  $90^\circ\text{C}$ , the printed features exhibit an electrical conductivity analogous to that of bulk silver ( $6.3 \times 10^5\text{ S/cm}$ ).



[Ref: S. B. Walker and J. A. Lewis, "Reactive silver inks for patterning high-conductivity features at mild temperatures," *Journal of the American Chemical Society*, **134** (2012) 1419-1421.