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Inkjet Printing of Metallic Nanoparticle Inks on Ultra-thin Deformable Substrates

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Particle-based conductive inks are suitable materials for flexible and stretchable electronic devices. The printing of microstructures from metallic nanoparticles on deformable substrates has attracted much interest both in academic research and industry in recent years [1,2]. Here, we study the inkjet printing of metallic nanoparticles and their performance on flexible and stretchable ultra-thin polymeric substrates. A PiXDRO LP50 (Meyer Burger, Switzerland) inkjet printer was equipped with a 10 pL Fujifilm Dimatix cartridges (DMC-11610) and used to print colloidal dispersions of silver and gold nanoparticles, both commercial and custom-made inks. The effects of ink properties such as metal loading, particle size, viscosity, density and surface tension on printing were systematically characterized to develop useful printing recipes. We investigated the compatibility (surface wettability, adhesion) of both the silver and gold nanoparticles inks with various substrates such as paper, polymers, textile fabric, and metal foils by characterizing the morphologies of the printed dots and lines. The electrical conductivity of the resulting structures was quantified, and the mechanical robustness of the printed circuits was examined by performing cyclic bending and stretching tests. We present first demonstrations of such structures in wearable sensors, confirming their suitability and reliability for practical applications.

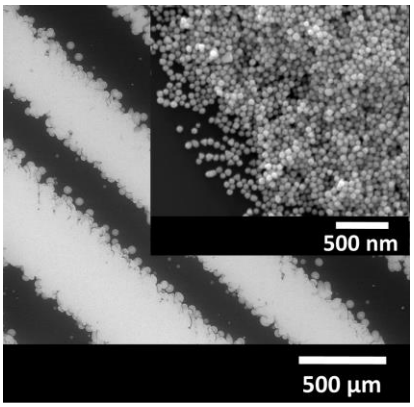

Figure 1: Scanning electron micrographs of inkjet printed lines containing gold nanoparticles on polymeric substrate.

References

[1] Trung, T.Q; and Lee, N. *Adv. Mater*. **2017** *29*, 1603167.
[2] Gao, M.; Li, L.; and Song Y. *J. Mater. Chem. C*. **2017** *5*, 2971-2993.