

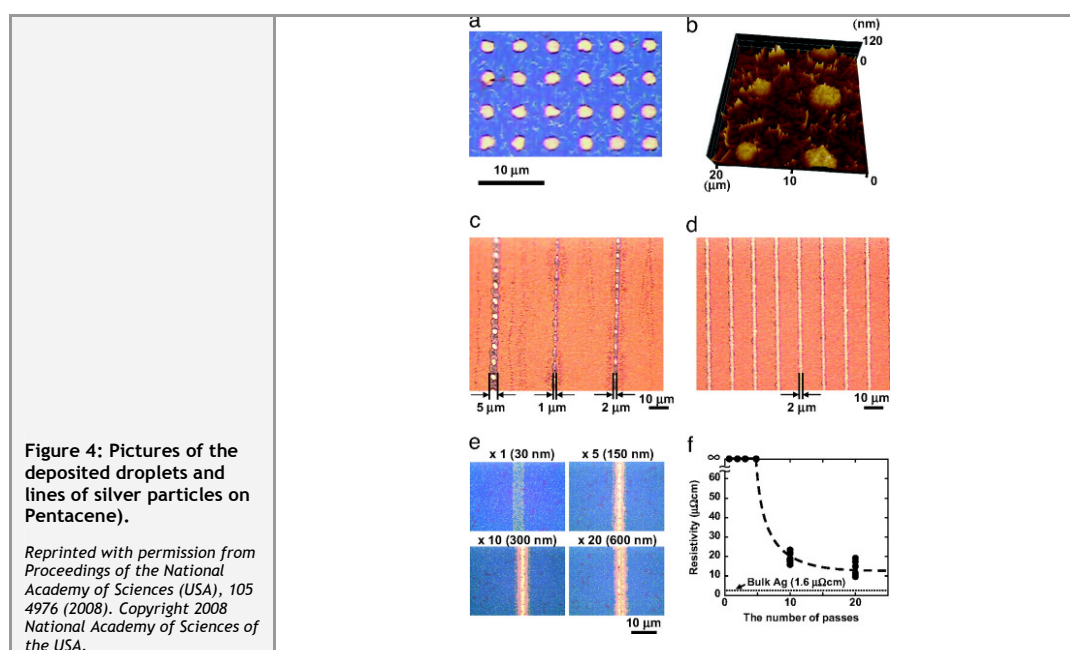
Univ. of Tokyo:  
High accuracy inkjet for organic transistors

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Organic transistors by  
subfemtoliter inkjet  
printing



This paper from the **University of Tokyo** presents a demonstration of subfemtoliter inkjet printing to define metal contacts with single micrometer resolution on the surface of semiconductor. The purpose is to create high performance p and n channel transistors in complementary circuit. Silver nanoparticles are used to print top contact electrodes on Pentacene. The volume of solution involved in this subfemtoliter process is so small that there is no degradation implied by the solvent of the solution. In fact the solvent evaporates before the droplet reaches the semiconductor. After the metal deposition the stack is annealed at 130°C allowing good conductivity. Another advantage of this specific behaviour is that there is no spreading of the particles on the surface. This permits to realise very accurate patterns for the electrodes with gaps of 1 or 2 μm. The authors succeeded to realise complementary technology inverter showing the efficiency of their technology. The semiconductors used are Pentacene in p-type and F16CuPc for n-type.



The novelty lies mainly in the nozzle of the inkjet system. It is manufactured from a very fine capillary glass tube less than 1 μm. The inside of the tube is hydrophilic, the outside is hydrophobic. A fine electrically conducting wire is located in the nozzle to charge the ink.

Clearly this very small volume inkjet process allows no degradation when stacking several materials and also allows higher accuracy for the patterning of electrodes.

“Organic transistors manufactured using inkjet technology with subfemtoliter accuracy” ; T. Sekitani, Y. Noguchi, U. Zschieschang, H. Klauk, T. Someya : *Proceedings of the National Academy of Sciences (USA)* 105, 4976 (2008).