Atmospheric Pressure Plasma Jet as a Dry Alternative to Inkjet Printing in Flexible Electronics

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Abstract
We have developed an atmospheric pressure plasma jet printing system that works at room temperature to 50 deg C unlike conventional aerosol assisted techniques which require a high temperature sintering step to obtain desired thin films. Multiple jets can be configured to increase throughput or to deposit multiple materials, and the jet(s) can be moved across large areas using a x-y stage. The plasma jet has been used to deposit carbon nanotubes, graphene, silver nanowires, copper nanoparticles and other materials on substrates such as paper, cotton, plastic and thin metal foils.

Plasma Jet Multi-Material Printer

- Nanocolloids, organic materials etc. transported as aerosol by carrier gas
- Precise control over thickness and morphology
- Ability to tailor material properties in situ (chemical, electronic)
- Can be combined as an in-line manufacturing process in additive manufacturing

Plasma Jet Printed Electronics

Silver nanowires on 3D printed ABS plastic
Copper on poly imide
On paper
On PET bottle

In-situ Tailoring of Material Properties

- In-situ reduction of Cu2+ to metallic copper
- No post processing, No pre-post thermal treatment
- Printed using same colloid

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