Electrohydrodynamic Jet Printing Driven By a Triboelectric Nanogenerator (#8292)

Electrohydrodynamic jet (e-jet) driven by a triboelectric nanogenerator for printing electronics

Inventors at Georgia Tech have developed an electrohydrodynamic jet that utilizes a rotary freestanding triboelectric nanogenerator (TENG) connected to a simple boost circuit that could supply an open circuit DC voltage above 1 kV. This is adequate to induce continuous droplet formation and ejection from the printing nozzle. A rotary freestanding TENG used in this technology acts as the high voltage power source for generating stable ink droplet ejection. Results reveal that the TENG's operation frequency allows for higher resolution printing with feature sizes smaller than nozzle size.

Benefits/Advantages

Safety: intrinsically limited charge transfer and current provide better safety for both personnel and instruments.

Cost-effectiveness: the TENG was simply operated using a rotary motor and the cost of the TENG device and boost circuit is less than 100 USD, while a commercial DC HV power source usually costs more than 1000 USD.

Controllability: owing to the charge dominating output characteristic of TENG, the droplet jetting frequency could be controlled by the TENG operation frequency.

Potential Commercial Applications

- Flexible displays
- Organic thin film transistors
- Printed circuit boards
- Polymer flexible solar cells

Background/Context for This Invention

Electrohydrodynamic jet (e-jet) printing is a high resolution printing solution where an electric field is used to print liquid through micro/nano-scale nozzles, as opposed to acoustic or thermal energy. The technology is commonly used for micro/nano manufacturing for patterning materials onto substrates. Among others, a big setback for commercializing this technology has been slow printing speeds. There is a need to increase printing speeds, lower cost, and produce higher resolution.

Dr. Zhong Lin Wang
Former Hightower Chair, Regents' Professor - Georgia Tech School of Materials Science and Engineering; Distinguished Professor - Georgia Tech College of Engineering

More Information

Publications

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/electrohydrodynamic-jet-printing-driven-triboelectric-nanogenerator

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot