

# Electrohydrodynamic Jet Printing Driven By a Triboelectric Nanogenerator

---

## 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.

### Summary Bullets

**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.

### Solution 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 and More Information

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.

## Inventors

- Dr. Zhong Wang  
Former Hightower Chair, Regents' Professor - Georgia Tech School of Materials Science and Engineering;  
Distinguished Professor - Georgia Tech College of Engineering
- Dong Lin  
Assistant Professor - Kansas State University Industrial and Manufacturing Systems Engineering
- Halil Tetik  
Graduate Student - Kansas State University Grad Student

## IP Status

:

## Publications

, -

## Images

Visit the Technology here:

[Electrohydrodynamic Jet Printing Driven By a Triboelectric Nanogenerator](https://s3.sandbox.research.gatech.edu//index.php/print/pdf/node/3425)

---

<https://s3.sandbox.research.gatech.edu//index.php/print/pdf/node/3425>