

Hybrid Triboelectric Nanogenerator Harvests Mechanical and Electrical Energy (#6606)

Sustainably and reliably generates power through simultaneous water energy collection

Inventors at Georgia Tech have developed a triboelectric nanogenerator (TENG) that can simultaneously harvest both mechanical and electrical energies from flowing water. Shaped like a water wheel, the TENG has wheel blades coated with thin, superhydrophobic films that collect electrostatic energy from flowing water. The device also collects mechanical kinetic energy as flowing water impacts and rotates the wheel. These two aspects of this technology are called water-TENG and disk-TENG, respectively, and together they form a hybridized, dual-mode TENG that can reliably generate a large power output.

In addition, the TENG also acts as a self-powered sensor to detect the rate of flowing water as well as wind speed and ethanol concentration. This technology could serve as an innovative solution for sustainably harvesting mechanical energy from the environment and could one day be integrated with a major power grid.

Benefits/Advantages

- **Sustainable:** Harvests energy from the environment to minimize the use of non-renewable materials for power
- **Highly efficient:** Exhibits an unprecedented conversion efficiency of 50% to 85%, an area power density of 313 watts per square meter, and a volume power density of 340 kilowatts per cubic meter
- **Powerful:** Integrates with several other TENGs for output power of 1 megawatt

Potential Commercial Applications

- Remote sensors
- Self-powered electronic devices
- Self-powered nanosensors
- Power consumption reduction in power systems

Background/Context for This Invention

Interest in technologies that can harvest renewable energy from the environment is increasing and, while Georgia Tech has developed several applications for the TENG, this variation can be used in wet conditions and utilizes contact electrification with sources other than solid materials. Innovations like this hybridized TENG are particularly desirable in remote locations where power sources may be sparse or for agencies looking to save costs by reducing the power consumption of their systems. Such a technology would also be highly useful across industries that require remote sensing applications, including military/aerospace, wireless networks, energy and utilities, environmental monitoring, oceanography, manufacturing, automotive and aerospace electronics, and even for medical devices.

Dr. Zhong Lin Wang

Former Hightower Chair, Regents' Professor - Georgia Tech School of Materials Science and Engineering; Distinguished Professor - Georgia Tech College of Engineering

Dr. Zong-Hong Lin

Professor– National Tsing Hua University

Patent/IP Information

U.S. Patent Issued

[US10439517B2](#)

<https://patents.google.com/patent/US10439517B2/en?q=10%2C439%2C517>

Publications

[*Simultaneously Harvesting Electrostatic and Mechanical Energies from Flowing Water by a Hybridized Triboelectric Nanogenerator*](#), ACS Nano, January 27, 2014

For more information about this technology, please visit:

<https://licensing.research.gatech.edu/technology/hybrid-triboelectric-nanogenerator-harvests-mechanical-and-electrical-energy>