Scilight

NEWS | FEBRUARY 06 2023

Harvesting wind energy to power microelectronic sensors

FREE

Avery Thompson

Scilight 2023, 061102 (2023)
https://doi.org/10.1063/10.0017258

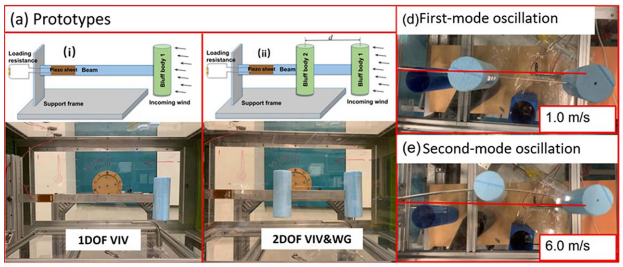
Scilight

6 February 2023

Harvesting wind energy to power microelectronic sensors

Avery Thompson

Aeroelastic system employs two degrees of freedom to draw power at both high and low wind speeds.



Microelectronic devices can be long-lasting, low maintenance sensors for use in remote or inaccessible locations. They can monitor structural health in buildings or bridges, track ocean currents on remote buoys, alert authorities to wildfires, and provide a noninvasive way to study wildlife. However, the nature of these devices means it can be challenging to supply power to them.

Chen et al. developed a piezoelectric aeroelastic energy harvesting system that can generate power through vortex shedding mechanisms. Their system can be used in many environments and can supply electric power to sensors or other microelectronic devices.

“The results support the development of self-powered sensor networks wherever small-scale or low-speed wind energy sources are available, enabling sustainable structural and environmental monitoring applications,” said author Liya Zhao.

The team exploited two related vortex shedding mechanisms, vortex-induced vibration and wake galloping. Both can be used to produce electricity, but the former is only effective within a narrow range of wind speeds and the latter is only effective at high wind speeds.

The authors built their energy harvester with two elastically connected cylinders that can oscillate in two different modes. With these two degrees of freedom, the design takes advantage of both mechanisms and harvests energy efficiently at low and high wind speeds.

“Our design offers a lower onset wind speed, high efficiency at low wind speeds, controllable vibration displacement at high wind speeds to avoid structural damage, and an overall much wider range of operational wind speeds for energy harvesting,” said Zhao.

The authors plan to further refine their design and implement field tests to determine its reliability in practical applications.

Source: “A two-degree-of-freedom aeroelastic energy harvesting system with coupled vortex-induced-vibration and wake galloping mechanisms,” by Shun Chen, Chun H. Wang, and Liya Zhao, *Applied Physics Letters* (2023). The article can be accessed at https://doi.org/10.1063/5.0128616.

This paper is part of the Energy Conversion and Storage in Functional Dielectrics Collection, learn more here.