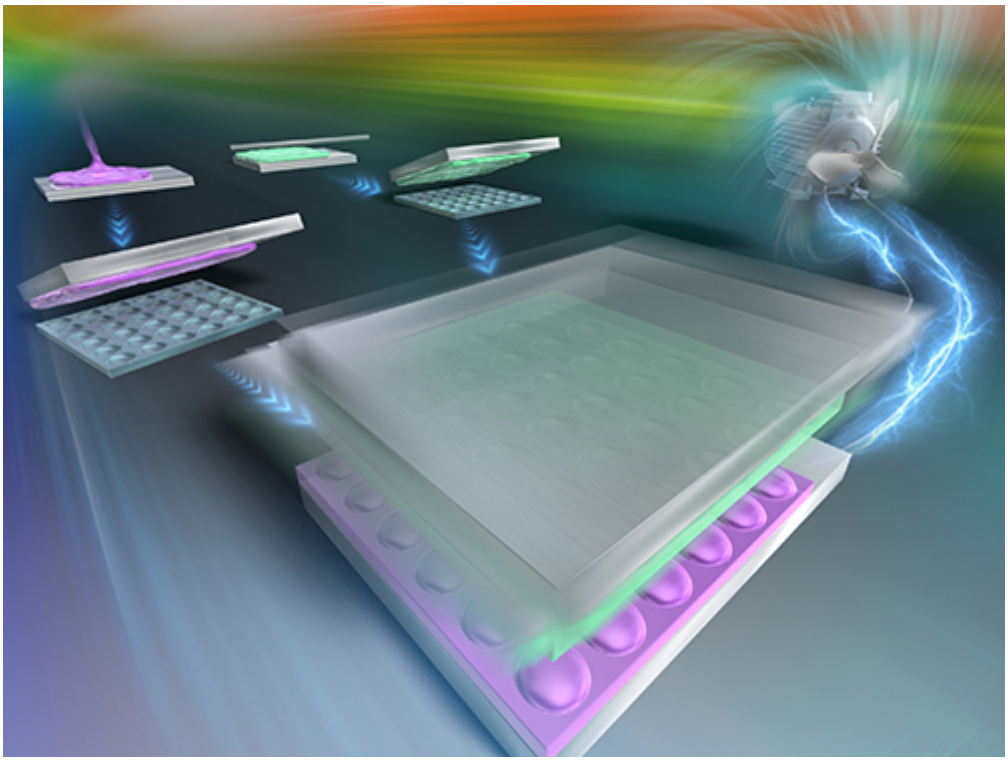
# Research Highlights

## [Vol. 71]
## Harvesting Energy at Nanoscale with Triboelectric Nanogenerators (TENG)

Previous Index Next

**12 Nov, 2021**

**New research at MANA advances the field of triboelectric nanogenerators (TENG), devices that hold promise in wireless charging of energy storage devices such as batteries and capacitors. This could pave the way for new ways to harvest mechanical energy without the need for any external amplification and boosters, and wirelessly transmit the generated energy for storage.**



A triboelectric nanogenerator is an energy-harvesting device that converts external mechanical energy at nanoscale into electricity. These devices can be used to utilize all kinds of mechanical energy that is available but wasted in daily life, such as human motion, walking, vibration and mechanical triggering.

The technology has been generating avid interest worldwide. The first papers on TENG were published only recently, in 2012, by Prof. Zhong Lin Wang's group at the Georgia Institute of Technology, and since then the performance and efficiency of the devices have improved dramatically. Early on, it was found that adding nanostructures to the surfaces of the active materials improved their efficiency, as it increases the surface area and thus the amount of charge transfer.

The MANA team, led by Ken C. Pradel of MANA and Naoki Fukata, Principal Investigator and Group Leader of MANA's Nanostructured Semiconducting Materials Group, devised a simple geometric

model showing how arrays of hemispheres can interlock and increase the amount of surface contact.

They correlated this with a polyamide and polyvinylidene fluoride model system, TENG. They found that by tuning the spacing between the pattern features, the output voltage and current can be greatly improved.

“By deepening our understanding of the surface interactions in these devices, we can optimize them in smarter ways to reduce cost and improve performance,” they said.

This research was carried out by Ken C. Pradel, JSPS Fellow at the time of research (WPI-MANA), and his collaborator.

## Reference

“Systematic Optimization of Triboelectric Nanogenerator Performance Through Surface Micropatterning”
Ken C. Pradel and Naoki Fukata
Journal: Nano Energy Volume 83 [May 2021]
DOI : 10.1016/j.nanoen.2021.105856

（MANA E-BULLETIN）
https://www.nims.go.jp/mana/ebulletin/

## Affiliations

International Center for Materials Nanoarchitectonics (WPI-MANA), National Institute for Materials Science (NIMS), Namiki 1-1, Tsukuba, Ibaraki 305-0044, Japan

## Contact information

**International Center for Materials Nanoarchitectonics(WPI-MANA)**

National Institute for Materials Science
1-1 Namiki, Tsukuba, Ibaraki 305-0044 Japan
Phone: +81-29-860-4710
E-mail: mana-pr[AT]ml.nims.go.jp