nature nanotechnology

Research Highlights

Nature Nanotechnology
Published online: 12 October 2007 | doi:10.1038/nnano.2007.366

Subject Category: Nanosensors and other devices

Nanowires: Taking the strain

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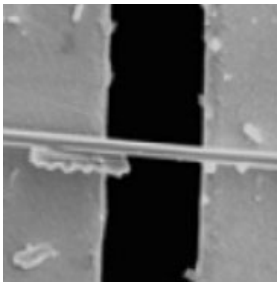
Electricity can be generated from single barium titanate nanowires when they are mechanically strained, suggesting that this material may prove useful for energy-harvesting applications



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Although zinc oxide and gallium nitride nanowires have shown piezoelectric properties — the ability to generate electricity in response to mechanical stress — they produce a relatively low amount of electrical energy per unit of stress applied (a figure-of-merit known as the charge constant). Now, researchers at the University of Illinois, Urbana-Champaign in the US show that nanowires of barium titanate, a material with a much higher charge constant, might be a better choice for energy-harvesting applications.

Min-Feng Yu and colleagues[1] used a precision tensile mechanical testing stage comprising two platforms separated by a 3 micrometre gap — one movable and the other stationary — to apply a load to a single barium titanate nanowire and measure the resulting voltage response. The nanowire was strung across the gap between the platforms and a thin layer of platinum was deposited at each end to fix it into place. Displacement of the movable platform, driven by a piezoelectric flexure stage, induced a mechanical load in the nanowire. In agreement with modelling experiments, the voltage generated by the nanowire was found to be directly proportional to the applied load.

The electric energy output per cycle of the system was estimated at 0.3×10^{-18} J, which is more than 16 times that of a zinc oxide nanowire. The energy conversion efficiency, however, is still low and needs to be optimized. Nonetheless, this system could potentially be used for future energy-harvesting applications in which the nanowires are activated by environmental vibrations.

Reference

1. Wang, Z., Hu, J., Suryavanshi, A. P., Yum, K. & Yu, M.-F. Voltage generation from individual $BaTiO_3$ nanowires under periodic tensile mechanical load. *Nano Lett.* doi: 10.1021/nl070814e (2007). | **Article** |

Nature Nanotechnology ISSN 1748-3387 EISSN 1748-3395