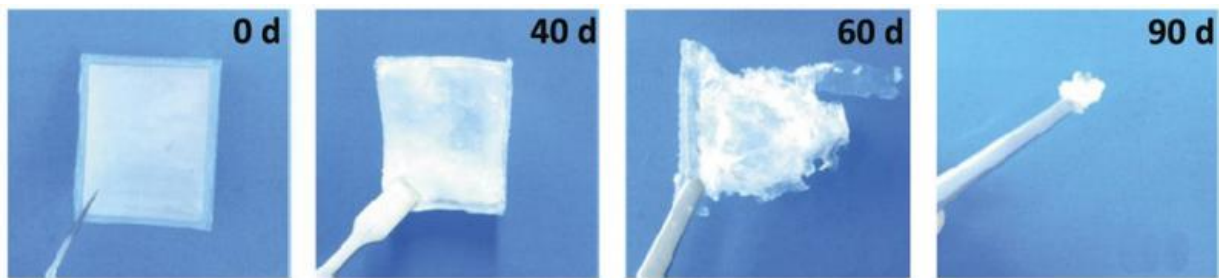


New type of bioegradable nanogenerator for use inside the body does not need external power source

March 7 2016, by Bob Yirka



Photographs from BD-TENG at various stages of the degradation time line suggest that devices encapsulated in PLGA were initially resistant to mass degradation. However, after 40 days, significant mass loss and structure disintegration was initiated. Near-total mass loss was observed at 90 days. Credit: *Science Advances* (2016). DOI: 10.1126/sciadv.1501478

(Phys.org)—A team of researchers with the National Center for Nanoscience and Technology and Beihang University, both in China, has developed a biodegradable triboelectric nanogenerator for use as a life-time designed implantable power source in an animal body. In their paper published in the journal *Science Advances* the team describes their nanogenerator, its possible uses and the ways it can be tweaked for use in different applications.

Scientists have been working on developing internal devices for many years and several have been created and are now in use inside human patients—the pacemaker is the most well known. But to date, all such devices suffer from the same deficit—none run using an internal [power source](#), which means they must rely on batteries. While batteries are convenient, they tend to run out of power, which means a patient must undergo a surgical procedure to have them replaced and surgical procedures by their very nature are risky because they open the body to possible infection. A better way, as the researchers with this new effort point out, would be to have [implantable devices](#) running off a power source that is generated inside the body, such as capturing heat or making use of the movement of blood. The new device they have created generates electricity via triboelectricity—where electricity is generated when two materials touch each other and then separate, one of the common ways that static electricity comes about.

The new device consists of two strips of multi-layered material. One of the strips has a flat film outer layer, the other strip has nanometer sized protruding rods on its exterior—when the two strips meet and then pull away, a tiny amount of electricity is created. The layers are kept apart by blocks of a biodegradable polymer; [electricity](#) is generated as parts of the body moves in a way that causes the two strips to come into contact and then to pull apart—over and over.

Testing of the device showed it was capable of producing a power density of 32.6 milliwatts per square meter, which they found was enough to power a neuron-stimulation device used to steer the way neurons grow. The team claims their [device](#) has paved the way for a new generation of internal devices, noting that not only is it biodegradable, but it can be tuned to self-destruct over days, months or even years. Similar devices, they note, could be made to work by utilizing the power from a person breathing or from their heart beating.

More information: Q. Zheng et al. Biodegradable triboelectric nanogenerator as a life-time designed implantable power source, *Science Advances* (2016). [DOI: 10.1126/sciadv.1501478](https://doi.org/10.1126/sciadv.1501478)

Abstract

Transient electronics built with degradable organic and inorganic materials is an emerging area and has shown great potential for in vivo sensors and therapeutic devices. However, most of these devices require external power sources to function, which may limit their applications for in vivo cases. We report a biodegradable triboelectric nanogenerator (BD-TENG) for in vivo biomechanical energy harvesting, which can be degraded and resorbed in an animal body after completing its work cycle without any adverse long-term effects. Tunable electrical output capabilities and degradation features were achieved by fabricated BD-TENG using different materials. When applying BD-TENG to power two complementary micrograting electrodes, a DC-pulsed electrical field was generated, and the nerve cell growth was successfully orientated, showing its feasibility for neuron-repairing process. Our work demonstrates the potential of BD-TENG as a power source for transient medical devices.

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