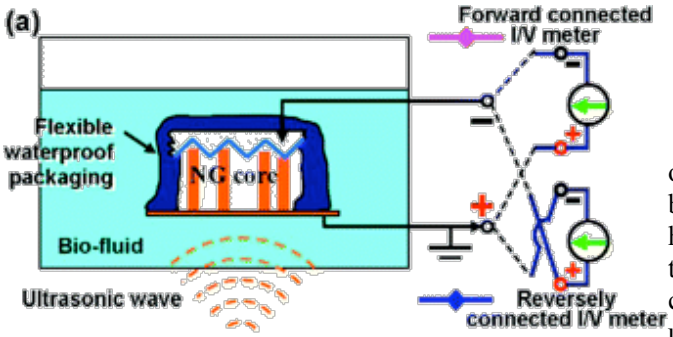
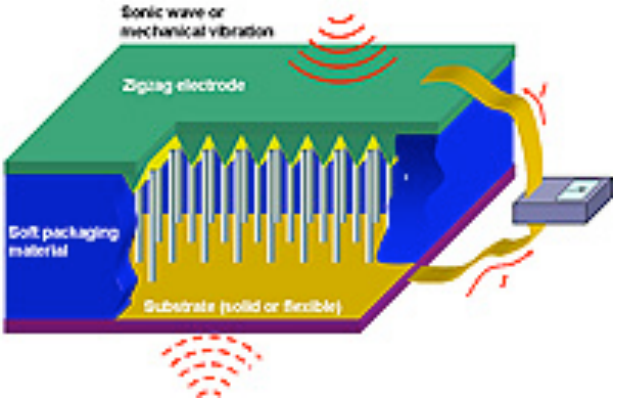
Nanogenerator

Vishnu Devalla, Biomedical Engineering, University of Rhode Island

Nanotechnology is a field whose theme is the control of matter on an atomic and molecular scale, nanotechnology deals with structures of the size 100 nanometers or smaller. Nanotechnology is extremely diverse ranging from novel extensions of conventional device physics. Nanogenerator is a prototype nanometer-scale generator that produces continuous direct-current electricity by harvesting mechanical energy from such environmental sources as ultrasonic waves, mechanical vibration or blood flow. Based on arrays of vertically-aligned zinc oxide nanowires that move inside a novel "zig-zag" plate electrode, the nanogenerators could provide a new way to power nanoscale devices without batteries or other external power sources.



The Nanogenerator is constructed with an electrode lowered on top of the nanowire array, leaving just enough space so that a significant number of the nanowires are free to flex within the gaps created by the tips. Moved by the mechanical energy such as waves or vibration, the nanowires periodically contact the tips, transferring their electrical charges. By capturing the tiny amounts of current produced by hundreds of nanowires kept in motion, the generators produce a direct current output in the nano-Ampere range. The Nanogenerator could produce as much as 4 watts per cubic centimeter- based on a calculation for a single nanowire. The Nanogenerator would produce enough power to operate nanometer scale defense, environmental and biomedical applications, including biosensors implanted in the body, environmental monitors, and even nanoscale robots. April 14, 2006 issue of the journal Science, Wang's research team announced the concept behind the nanogenerators. At the time the Nanogenerator could harvest power from just one nanowire at a time by dragging the tip of an atomic force microscope over it. Made of platinum coated silicon, the tip served as a schottky barrier, helping accumulate and preserve the electrical charge as the nanowire flexed and ensuring that the current flowed in one direction.



With its multiple conducting tips similar to those of an AFM, the new zig-zag electrode serves s a schottyky barrier to hundreds or thousands of wires simultaneously, harvesting energy from the nanowire arrays. Ultrasonic tests were performed on the Nanogenerator to measure the current flow, the flow was continuous as long as the ultrasonic generator was operating. Zinc oxide is a non-toxic and compatible with the body, the new nanogenerators could be integrated into implantable biomedical devices to wirelessly measure blood flow and blood pressure within the body.

References:

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