



Nanowire-Based Piezoelectric Power Generation

NASA has filed a patent on a unique nanowire-based piezoelectric (PE) power generation technology. Sensors have improved in terms of size, capability and power consumption, but their deployment in remote areas and even not-so-remote locations are restricted by battery power supplies. Using PE materials for energy scavenging is a possible pathway to remedy this situation. The technology that is being patented converts existing sources of nonpolluting energy (mechanical strain) from nature into electricity. The quantity of energy produced is not massive but it can be easily generated from free sources such as vibrations and electromagnetic waves. PE materials convert applied strain into electricity or alternatively, if current is applied, they deform. Energy scavenging is appealing in cases where there is a continuous need for small amounts of power. Devices made with this technology can be used by themselves or in tandem with other generating technologies. At night, when solar cells don't provide power, scavenged energy could continue to increase the battery charge or could prevent discharging.

This technology is available for licensing from NASA's space program to benefit U.S. industry.

Technology Details

The PE materials are grown in a nanowire form, and include ZnO, GaN, AlN, and lithium niobate. They can be grown using a vapor-liquid-solid approach, by embedding the PE materials in a soft matrix (like a polymer) in order to withstand large strains without falling apart. The key is not to lose the basic PE properties after embedding them in a polymer. This is accomplished by utilizing a polymer known to have PE properties, which results in a composite that maintains the original material while sustaining large strains. The wires are grown on a substrate and then the array is intercalated with polyvinylidene difluoride (PVDF) using a spin-on technique. The nanowire-based PE material thus prepared can be fabricated into a suitable device that can be subjected to natural and man-made vibrations in an effort to convert the strain into electricity. The material form and approach will provide enhanced PE properties relative to the state-of-the-art while being able to take on maximum strain.

Commercial Applications

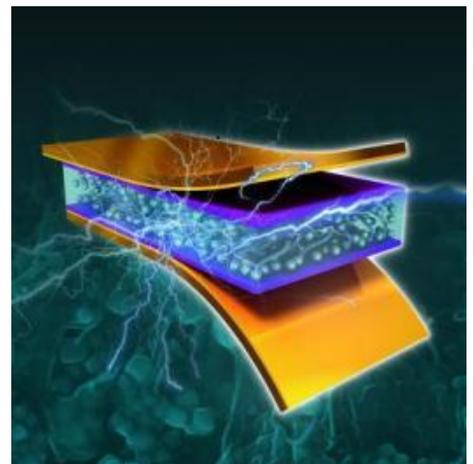
- Biomedical technology
- Intelligent / Security
- Consumer electronics
- Communications

Patent

This technology is protected by a pending U.S. Non-Provisional Patent Application.(Reference No. ARC-16405-1)

Benefits

- Converts mechanical strain and vibrations into electricity
- Can be used by itself or in tandem with other generating technologies
- Cost-effective with robust technology
- Provides enhanced piezoelectric properties



Nanocomposite generator