Nina Shpylova
N. V. Khalipova, research supervisor
I. M. Svetlysheva, language adviser
Ukraine Academy of Customs, Dnipropetrovsk

New Nuclear Battery

Our society is placing ever-higher demands for power from all kinds of devices. For 50 years, people have been investigating converting simple nuclear decay into usable energy, but the yields were always too low. New Nuclear Battery runs 10 years, 10 times more powerful. A battery with a lifespan measured in decades is in development ,as scientists demonstrate a new fabrication method that in its roughest form is already 10 times more efficient than current nuclear batteries and has the potential to be nearly 200 times more efficient.

The technology is geared toward applications where power is needed in inaccessible places or under extreme conditions. Since the battery should be able to run reliably for more than 10 years without recharge or replacement, it would be perfect for medical devices like pacemakers, implanted defibrillators, or other implanted devices that would otherwise require surgery to replace or repair. Likewise, deep-space probes or deep-sea sensors, which are beyond the reach of repair, also would benefit from such technology. The new battery technology makes its successful gains by dramatically increasing the surface area where the current is produced. Similar to the way solar panels work by catching photons from the sun and turning them into current, the science of betavoltaics uses silicon to capture electrons emitted from a radioactive gas, such as tritium, to form a current. As the electrons strike a special pair of layers called a “p-n junction,” a current results. What’s held these batteries back is the fact that so little current is generated—much less than a conventional solar cell. Part of the problem is that as particles in the tritium gas decay, half of them shoot out in a direction that misses the silicon altogether. A layer of silicon riddled with pits, each of which would fill with the radioactive tritium gas, would be like dropping the sun into a deep well lined with solar panels. Almost all of the sun’s rays, no matter which way they were emitted, would strike a well wall. Only those rays that fired straight up and out of the well would be lost. The pits, or wells, are only about a micron wide (about four ten-thousandths of an inch), but are more than 40 microns deep. After the wells are “dug” with an etching technique, their insides are coated with a material to form a p-n junction just a tenth of a micron thick, which is the best thickness to induce a current.

It can be concluded that this development is very important and necessary for society, because it has a number of significant advantages in its use.