# New sensor provides better leak protection in buildings

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A new, battery-free sensor can detect water leaks in buildings at a fraction of the cost of existing systems.

The tiny device, developed by researchers at the University of Waterloo, uses nanotechnology to power itself and send an alert to smartphones when exposed to moisture.

By eliminating a battery and related circuitry, researchers estimate their sensor could be commercially produced for $5 each, about a tenth of the cost of current leak detection devices on the market.

"One of the big issues related to water damage in buildings is that owners don't install enough sensors because they are too expensive," said George Shaker, an engineering professor at Waterloo. "The much lower cost of our sensor enables the deployment of many, many more to greatly improve protection."

Water leaks are the leading cause of property losses in apartments, offices and other buildings, resulting in expensive repairs and higher insurance premiums.

The new sensor, which is smaller than a nickel at five millimeters in diameter, is comprised of stacked nanoparticles. When the nanoparticles get wet, a chemical reaction produces enough electricity to power a wireless radio and additional sensors to record environmental conditions such as temperature.

The wireless radio and other sensors are on a circuit board packaged with the leak sensor in a box just three centimeters square.

"We harvest the energy that is created when the sensor is exposed to water and that energy then powers the electronics to send an alert to the user's cellphone via the internet," said collaborator Norman Zhou, a professor of mechanical and mechatronics engineering.

In addition to being cheaper, the new sensors are environmentally friendly, reset after use, can be installed in hard-to-reach places—including otherwise inaccessible areas during building construction—and require much less maintenance.

While they explore commercialization, researchers are also pursuing additional applications for the underlying technology, including in diapers for the elderly and in bandages to detect wound leakage after surgery.

"We believe this has the potential to solve several important problems," said Shaker, a cross-appointed professor of electrical and computer engineering, and mechanical and mechatronics engineering.

A paper on the research, "Development of novel water leak detection mesh network utilizing batteryless sensing nodes," was presented at a recent international conference on smart cities and the Internet of Things.

Provided by University of Waterloo