pH sensor 500 times thinner than human hair

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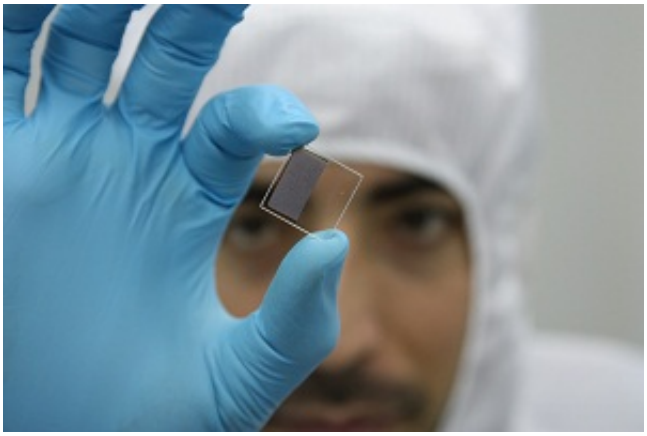

PhD student Ali Sardarinejad holding a thin film of ruthenium oxide used in the new pH sensor. Credit: Edith Cowan University

Nano-scientists have innovated a new pH sensor 500 times thinner than a human hair, in a state-of-the-art cleanroom facility using ruthenium oxide nano-film.

According to ECU, the new device replaces the traditional glass electrode that has been in use since the 1930s.

ECU Electron Science Research Institute Director Kamal Alameh says the approach involved integrating the ruthenium oxide sensor with a transmitter.

The entire device is so small it fits into a capsule around 1cm in length

and 0.5cm in diameter.

Inside the capsule, the sensor reads voltage, which then translates as a pH level or acidity reading of whatever substance is being tested.

"The sensor is comprised of two electrodes made from very sensitive and accurate material," Professor Alameh says.

"The sensor and the transmitter's electronic coil receive external magnetic energy which converts to power.

"Then the circuit board electronics convert the received data from the sensor into digital data to send it through the transmitter."

Prof Alameh says the ruthenium oxide sensor is incredibly small, and the transmitter takes up the majority of the capsule's space.

"Normally people who work with ruthenium oxide use a different technology, but we use RF, a radio frequency magnetron sputtering system, in our clean room here at ECU," he says.

"You acquire a common 'disc', and then you apply the RF source into it using argon gas, which then allows a high vacuum in which we can release just one molecule at a time to make a very thin structure.

"So it is built molecule by molecule. You can see the area of the disc while you are working but you cannot see the thickness of course."

Prof Alameh says the new pH sensor can be used in a wide array of practical applications, from agriculture, environmental science, water treatment, and "anywhere that pH is an important parameter".

As the device fits into a capsule, it can be applied in medicinal settings

because patients can swallow the device.

One of the most exciting pathways is its application in the oil and gas industry.

The scientists are in engaged in talks with parties from oil and gas who are interested in applying the sensor to monitor the pH levels in pipelines.

PhD student Mr Ali Sardarinejad also worked on the paper, "High-sensitivity pH sensor employing a sub-micron ruthenium oxide thin-film," which has been published in the journal of Sensors and Actuators A.

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