

A revolution in pH measurement



Accurate pH measurement is essential in industries ranging from pharmaceuticals to brewing

Professor Richard Compton's group at the University of Oxford has developed the world's first calibration-free pH meter, representing the first major advance in pH measurement for 80 years.

Accurate pH measurement is essential in industries ranging from pharmaceuticals to brewing. It is perhaps surprising, then, that the standard equipment for measuring pH – a glass electrode connected to an electronic meter that measures and displays the pH reading – has effectively remained unchanged since it was developed in the 1930s. The technique has significant drawbacks: electrodes are expensive and fragile, pH measurements are easily corrupted, and for precise work the meters need calibration before every single measurement.

pH meter calibration wastes vast amounts of time (and therefore money), and incorrect calibration and other errors can also lead to huge costs for companies in terms of wasted supplies and products – all factors which underline the pressing need for a pH meter that does not require calibration.

The potential for developing such a device was spotted by Professor Richard Compton, whose research group has worked on a wide range of electrochemical sensors based on electrodes coated in carbon nanotubes. If his team could identify a molecule whose electrochemical properties varied consistently with pH, Compton believed it would be possible to create a new breed of pH sensors.

Compton and his group investigated molecules which would give a reproducible and predictable pH response, and identified a suitable substance – anthraquinone-derivatised carbon, or AQcarbon. This made it possible to develop a simple pH probe that gave accurate readings. By measuring the



A standard pH meter requiring calibration and using glass electrodes

potential difference between signals from both pH sensitive and pH insensitive probes, the pH of a solution could be assessed directly with no need whatsoever for calibration.

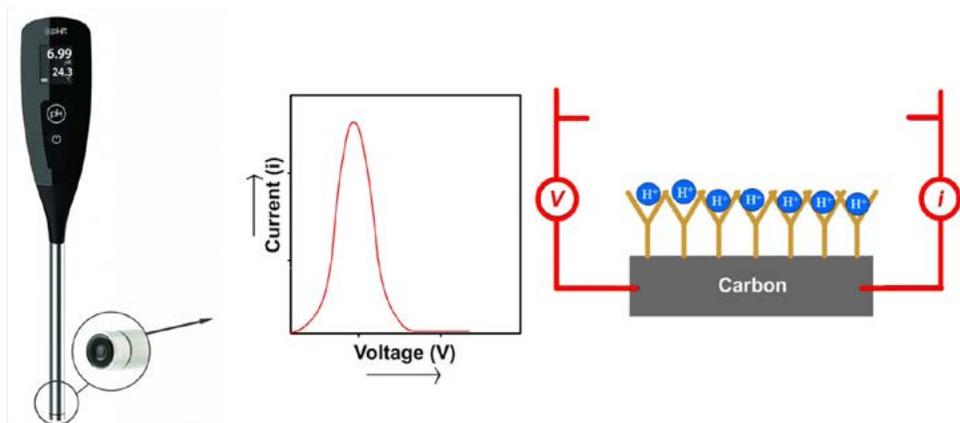
This groundbreaking technology was patented and then licensed by Isis Innovation (the technology transfer arm of the University of Oxford) to San Francisco-based Senova Systems Inc. The company was founded in 2007 with the sole aim of developing a commercial calibration-free pH meter based on the Compton research.

In the first instance Senova designed a prototype hand-held pH sensor, the pHHit Scanner, which had a number of significant advantages over existing pH meters: it was temperature stable, intuitive to use, and scalable for production and – most importantly – required no calibration. The scanner was

previewed at Pittcon 2012, the world's largest annual conference and expo for laboratory science, and in September 2012 won the Frost & Sullivan 2012 North American New Product Innovation Award. In March 2013, the pHHit Scanner was recognized with the Pittcon Editors' Gold Award for the best new product at Pittcon 2013.

Following successful field trials with end-users in diverse sectors, Senova is now developing a commercial product with additional features to meet segment application needs. Senova has secured venture capital to drive the technology towards commercialization.

The calibration-free pH measurement system invented by the Compton group is a truly innovative technology with the potential to revolutionise this field, and represents a landmark in pH sensing.



The pH meter developed by Senova will sense pH directly with no need for calibration