Glass electrode powers smallest pump

I-Micronews

Applying an electrical current to nanodevices is inherently tricky. Using non-conductive materials makes it even more difficult because they require wires inserted into them, yet they tend to be too small to make the integration of all these moving parts possible.

To solve this problem, Alan Hunt from the University of Michigan in Ann Arbor and his colleagues used a laser to hollow out a bent pipe inside a piece of glass. This resulted in a tiny tunnel with a thin glass wall at one end.

Insulating materials such as glass, wood and plastic can conduct electricity at high voltages, but they usually suffer in the process. "*When lightning hits your house, the bolt will pass through your roof, but you end up with a lot of damage,*" says **Hunt**.

But a few years ago, his team found that at the nanoscale, ordinary glass becomes conductive without breaking. "*When you go down to the nanoscale, the world doesn't behave as we're used to,*" says **Hunt**.

If Alice ate a mushroom in Wonderland and shrank to the size of a gnat, says Hunt, the thread in her dress would be about as thick as the conductive glass wall in the electrode.

Miniature laboratories
When filled with an electrically conducting solution, the tiny pipe becomes a liquid 'wire', with the glass wall at its tip acting as an electrode.

The team have used the electrode to transfer power to an assembly of glass channels that forms the smallest pump ever built, four micrometres across and containing three channels that are 0.6 micrometres wide. The pump can control a flow rate of one-thousandth of one-trillionth of a litre per second.

Control over such minuscule volumes could be useful for taking fluid samples from infected cells, or delivering small drug doses to extremely localized sites. Scientists studying cells interacting in a dish could deliver chemicals to a single cell and see how its neighbours were affected.

Many microfluidic devices are made from glass and other transparent materials, and so are amenable to the new laser technique. Etching electrodes and channels directly into them using the new laser technique could make such devices simpler, says Hsueh-Chia Chang, a specialist in microfluidics at the University of Notre Dame in Indiana.

SOURCE [1]

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