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15 January 2010

Country: United States

## New approach for self-assembling electronics

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Several organizations have demonstrated self assembling electronic devices, using the fact that oil and water based liquids do not mix. These effects exploit the effect of gravity, such that when the fluid lands on the substrate it moves slightly to settle into defined crevices, enabling high resolution device features. However, despite the demonstrators to date this process has not been scaled or commercially used to manufacture electronics because no-one has been able to demonstrate this working with high yield.

Recently the proceedings of the National Academy of Sciences documented a new self assembly technique developed at the University of Minnesota that was designed to enable high volume, high yield self assembly manufacture. The process involves making the electronic devices at the interface between oil and water. Their demonstrator product is a solar cell, where they have built a "blank" grid that contains depressions lined with solder, each intended for individual solar elements. The grid is coated with a hydrophilic molecule (that attracts water).

The materials used in the study were silicon cubes with side lengths of about 20-60 µm, with a gold contact on one side. The gold contacts were coated with a hydrophilic molecule and the silicon side was coated by a hydrophobic molecule.

When added to an oil-water mixture, the researchers found that the cubes assembled neatly along the liquid interface. Using this process the researchers were able to create a sheet of the elements that float between the oil/water boundary. The device grid is then passed through the oil/water boundary slowly, and element fixes into place neatly on the grid substrate as the solder attracts its gold contact.

Using this process at 95 degrees Celsius, the research team made a working solar cell comprising of 64,000 elements in just three minutes. The team is now research how small they can make individual elements and how large finished devices can be.

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Article by **Raghu Das**

Raghu Das is the CEO of IDTechEx. He has authored many reports on the topic and conducts global consulting projects.

Telephone: + 1 617 577 7890  
Email: [r.das@IDTechEx.com](mailto:r.das@IDTechEx.com)



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