

Transparent Carbon Nanotube Films Likely Successor to ITO for Commercial Applications

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Flexible carbon nanotube film on plastic. Photo courtesy of Unidym.

(PhysOrg.com) -- Will the legacy of Nobel prize winner Richard Smalley finally be fulfilled? Ever since his pioneering work in the mid 1990's on the synthesis of carbon nanotubes, companies have been struggling to find a commercial application for this amazing material. There was a nanotech "bubble" of start-up companies, none of which managed to successfully IPO due to lack of realizable commercial revenue. Is that about to change? Recent research by Rice University and



Unidym indicate that a fully realizable application is finally here for carbon nanotubes. Fortunately, it's in one of the fastest growing display markets, touch screens.

Carbon nanotubes (CNTs) are tiny hollow cylinders of carbon with tremendous electrical and optical properties. It turns out that very thin CNT films as thin as 10 or 20 nanometers are transparent to <u>visible light</u> and can conduct enough electricity to make them useful for many applications where these properties are needed. These applications include thin film solar cells, organic LEDs, and touch screens.

Currently, a ceramic material called indium tin oxide (ITO) is used in these applications. This material is deposited in vacuum and is quite brittle. Carbon nanotubes, on the other hand, can be deposited from solution, and are remarkably robust and flexible. Films can be coated about 50 times faster than ITO films, and are almost unbreakable when flexed, tapped, strained, or smashed with a hammer, while ITO films are brittle and easy to crack under strain.

Researchers predict that the first applications for these transparent CNT films will be as the <u>electrodes</u> in touch screens. This is because they already meet all technical requirements, and ITO has an issue in that it tends to crack after repeated use, thus degrading the <u>touch screen</u> response. Touch screens are a rapidly expanding market due to the popularity of the iPhone amongst other devices. By the end of the year, CNT films will begin to replace ITO in touch screens. As the technology continues to improve it will continue to take market share from ITO. This will be a remarkable achievement, and may issue in a new day for carbon nanotubes in various markets. I think Smalley would be pleased.

More information can be found in: "Continuous and Scalable Fabrication of Transparent Conducting <u>Carbon nanotube</u> Films" by Dan, Irvin, and Pasquali in *ACS Nano*, published on the web April 08, 2009.



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