Transparent, flexible CNT transistors

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A team from the University of California, Los Angeles and Germany's Max Planck Institute for Solid State Research has fabricated transparent and flexible transistors where both the bottom gate and the conducting source-drain channel are carbon nanotube (CNT) networks of different densities and Parylene N is the gate insulator [Artukovic *et al.*, *Nano Lett.* (2005) **5** (4), 757].

Previous transparent transistors have used either polymers (which suffer low mobility) or inorganic oxides (which do not have the desired flexibility and are difficult to manufacture). Here, in contrast, just two materials are used, ensuring simple manufacturing.

Field-effect transistors (FETs) can have conducting channels made from a random network of nanotubes of an appropriate density. Also, flexible transistors can be created by room-temperature fabrication.

Now, highly transparent FETs have been fabricated where CNT networks of different densities provide both the conducting channel and the gate. Simple spray technology is used to deposit 1% sodium dodecyl sulfate (SDS) aqueous solutions of nanotubes, in concentrations of 1 mg/ml for the gate (onto polyester sheet substrate) and 0.35 mg/ml for the channel (onto the parylene gate insulator).

The FETs have a mobility of 1 $cm^2 V^{-1} s^{-1}$ and an on/off ratio of 100. The latter is influenced by the properties of the insulating layer. Characteristics are little affected by repetitive bending and recover fully on release. Transparency is sufficient for use as active matrix displays and smart windows.

The potential to fabricate source and drain from CNT networks makes simple electronic devices possible.

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