

NEC Succeeds in Fabrication of CNT Transistor Using Coating Process

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NEC Corporation today announced the successful development of a carbon nanotube (CNT) transistor using a coating process. The basic operation of the new transistor with advanced characteristics has been verified, confirming its application in the printed electronics field.

Main features of the new CNT transistors:

(1) Based on an NEC device model, design guidelines were established to verify the relationship between transistor characteristics and the length and density of the CNT when the CNT channel is created and to increase CNT transistor performance.

(2) A channel coating-process technology, capable of accurately controlling the density of the CNT, was also developed. CNT transistors were produced based on the new design guidelines and technology. Despite performance variation, extremely high mobility - the speed at which electrons move in the material - for a transistor manufactured using this type of coating process was achieved.

The demand for electronics has rapidly increased in recent years along with environmental concern. This has brought about the need for more advanced electronic products that simultaneously achieve reduced environmental impact.

Organic transistors and other printed electronics are one potential solution to this problem. Printed electronics' technologies are unique in

that they allow transistors to be formed by printing directly onto the substrate. This means that manufacturing processes can be dramatically simplified in comparison to conventional semiconductors; waste materials generated through manufacturing processes can be reduced, and CO₂ emissions can be reduced by more than 90%.

The channel materials of conventional research organic transistors generally demonstrate little mobility and are therefore considered unsuitable for electronic devices with high-speed operation. The basic operations for a transistor formed using this coating process were confirmed for the newly developed CNT transistor, which adopts CNTs as its channel material to allow 100 times greater mobility than regular organic transistors. The research results prove the potential of CNTs as a core transistor material, even in the field of printed electronics. Further research is expected to show the potential to dramatically expand the scope of printed electronics applications.

NEC views the new CNT transistor technology as key to the development of electronic devices with minimal environmental impact, and will continue to proactively conduct research in this area to realize environmentally-sound products.

The results of this research will be presented at "Nanotech 2008 International Nanotechnology Exhibition & Conference" being held at Tokyo Big Sight from February 13 to 15.

Source: NEC

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