Angle Speeds Plastic Transistor

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Plastic computer chips have recently received a lot of attention because they promise to imbue everyday objects with inexpensive electronic intelligence and enable flexible displays and electronic paper.

Though they are flexible and potentially very inexpensive, organic electronic devices perform relatively poorly. This is because organic materials have low charge carrier mobility, which is a measure of how readily electricity -- or negatively-charged electrons and positively-charged holes -- moves through the material.

Researchers from Lucent Technologies' Bell Laboratories, Rutgers University and the University of Illinois have found that the orientation of crystalline organic semiconductors plays a big role in organic transistor performance.

The researchers have developed a simple lamination manufacturing process for making transistors from the fragile organic material, and the resulting transistors have set a record for carrier mobility in organic transistors.

The researchers' method could lead to mass production techniques for organic transistors and other organic semiconductor devices.

The researchers' field-effect transistor is formed from organic rubrene crystal and titanium and gold electrodes and has a carrier mobility of 15.4 square centimeters per volt second, compared to typical organic semiconductor carrier mobilities of less than one square centimeter per volt second. The silicon transistors commonly used in today's computer chips have carrier mobilities of 1,500 square centimeters per volt second.

The stamping method could be used in practical applications in three to five years, according to the researchers. The research appeared in the March 12, 2004 issue of *Science*.

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