Rutgers physicists test highly flexible organic semiconductors

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Research paves way for thin-sheet plastic displays or wearable electronics

Organic semiconductors hold promise for making low-cost flexible electronics – conceivably video displays that bend like book pages or roll and unroll like posters, or wearable circuitry sewn into uniforms or athletic wear. Researchers have demonstrated the ability to "print" transistors made of organic crystals on flexible plastic sheets, using technology that resembles inkjet or gravure printing.

However, for the technology's potential to be realized, scientists have to show that these organic semiconductors will withstand the rugged handling they invite – they will need to perform reliably in spite of frequent flexing and sharp bending.

In an article published Dec. 11, 2012 in *Nature Communications*, scientists led by Rutgers University physicist Vitaly Podzorov report they have demonstrated extremely flexible organic semiconductors that withstood multiple bending cycles in which the devices were rolled to a radius as small as 200 micrometers. The scientists worked with numerous crystalline devices they made and found no degradation in their performance.

Podzorov claims his is the first rigorous study of solution-crystallized organic semiconductors under various types of strain - sharp bending and repeated flexing along with compression and stretching. He acknowledges some earlier encouraging studies of mechanical robustness, but felt those lacked rigorous tests of flexibility involving different types of organic semiconductors, especially those that show the most promise for development of low-cost printed electronics. The scientists at Rutgers focused on two soluble small molecules (developed in the group of Prof. John Anthony at the University of Kentucky), depositing and crystallizing them on thin plastic sheets from solution, and claim the results should apply to numerous other organic formulations that researchers are investigating.

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