SSRL Aids Development of Plastic Electronics

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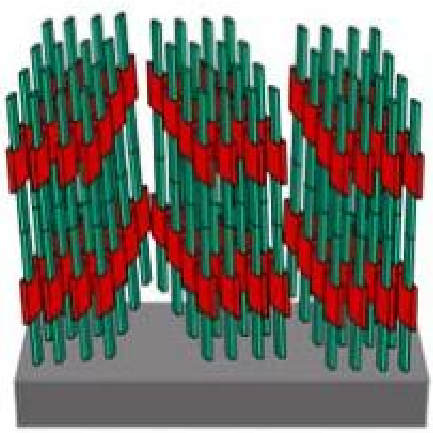

A plastic polymer conducts electricity much better when small crystals within the plastic polymer are aligned perpendicular to the surface. Image courtesy of Joe Kline, NIST

For close to a decade, researchers have been trying to improve the performance of plastic semiconductors to the level of amorphous silicon—the semiconductor used in low-cost electronics such as photovoltaic cells for solar power and thin-film transistors used in flat screen laptops and TVs.

Stanford Synchrotron Radiation Laboratory (SSRL) and Stanford University researchers have now shown that the electrical performance of plastic semiconductors can be controlled and improved with surface treatments. In their research, published in *Nature Materials* in March, they showed they could align the small crystals within the plastic polymer by applying a thin layer of organic molecules on to the surface. The highly-oriented crystals give the material better performance in conducting electricity. Researchers used x-ray scattering at SSRL to show the orientation of the crystals.

In a related paper, published in April's *Nature Materials*, Merck Chemicals in the United Kingdom developed a new polymer whose electrical mobility, related to conductivity, is the highest so far in a polymer, endowing the new polymer with performance comparable to amorphous silicon. SSRL, Stanford University and the Palo Alto Research Center characterized this new material, and found it has very highly-oriented crystals. "The structural properties of this new material are unprecedented for a polymer," said former Stanford graduate student Joe Kline, now a postdoctoral researcher at the National Institute of Standards and Technology.

Semiconducting polymers have many advantages over amorphous silicon: they are cheaper, faster and less energy-intensive to make; they can be dissolved in a solution and sprayed on, like ink from an inkjet printer; and they are flexible, an important trait for applications such as electronic paper.

Source: Stanford Linear Accelerator Center, by Heather Rock Woods provided for information purposes only.