High performance semiconductor spray paint

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Wake Forest University's Organic Electronics group has developed an organic semiconductor 'spray paint' that can be applied to large surface areas without losing electric conductivity

Researchers at Wake Forest University's Organic Electronics group have come up with a novel solution to one of the biggest technological barriers facing the organic semiconductor industry today. Oana Jurchescu, an assistant professor of physics, and a team of researchers developed a high performance organic semiconductor 'spray paint' that can be applied to large surface areas without losing electric conductivity. This is a potentially game changing technology for a number of reasons.

Organic thin film transistors are currently deposited by one of three methods. Drop casting and spin coating conduct electricity well but are limited to small area applications. They could not be used to make a wall-sized, flexible video screen for instance. On the other hand, organic spray-on techniques can be applied to large areas but have poor performance when compared to their small-area counterparts.

Jurchescu's work provides the best of both worlds. The spray-deposition technology developed in her lab produced the highest performance organic thin film transistors for this method to date - (April 2, 2013) - comparable to those of drop casting and spin coating. Unlike drop casting and spin coating, her spray-deposition technology can be applied over large surfaces to any medium-from plastic and metal to human skin.

Her team's research, High Mobility Field-Effect Transistors with Versatile Processing from a Small-Molecule Organic Semiconductor was published April 2, 2013 in the journal Advanced Materials.

Because of its superb performance and the fact it can be applied over large areas quickly (it is also inexpensive to process compared to inorganic semiconducting materials like silicon), it has the potential to be produced in commercial quantities. The technology is a big step towards realizing futuristic devices such as transparent solar cells on building windows, car roof and bus stations, electronic displays in previously inaccessible spaces and wearable electronics due to the organic plastics' thin, lightweight and conformal nature.

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