Large Area Printing of Organic Electronics

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Abstract

Organic electronic systems offer the possibility of lightweight, flexibility and large area coverage, properties not easily achievable with standard silicon technology, and at potentially lower manufacturing costs. DuPont has focused on the development of conducting and semiconducting organic materials that allow for the printing of active and passive electronic devices. A number of groups have focus in improving device performance by designing organic semiconducting materials of higher mobility. We demonstrate an alternative path for achieving high transconductance organic transistors in spite of relatively large source to drain distances. The method, based on creating sub-percolating conducting networks, would enable the printing of sub-micron features with conventional commercial engines. The improvement of the electronic characteristic of such a scheme is equivalent to a 60-fold increase in effective mobility without reduction of the on/off ratio.

These conducting and semiconducting composites are compatible with various large area printing processes such as thermal and ink jet. However, the manufacturing of complex multi-layer circuits over large areas in a reel-to-reel configuration has been one of the driving forces in the organic electronics field. We are currently evaluating the feasibility of micro-contact printing as a path to high-resolution reel-to-reel electronics. Thus extending flexography into the high-resolution arena. Unlike conventional lithography, micro-contact printing; not requiring sacrificial resists, developers, and etchants; maybe compatible with a wider range of materials and substrates currently utilized in plastic electronics.

Author Biography

Dr. Graciela Blanchet received her master's degree in Physics from the University of Buenos Aires, Argentina in 1977 and a Ph.D. in Physics from Brown University in 1981. She joined the University of Pennsylvania as a post-doc shortly thereafter and DuPont in 1982 where she is currently a research fellow. Her work at Dupont focused in conducting polymers, high temperature semiconductors and laser ablation of polymers. The latter leading to the creation of the Thermal Platform, that umbrella to digital products based on laser ablation has a combine expected NPV of about $1BM. The Thermal Platform includes Digital Cyrel and Digital color proofing, currently commercial products; Digital Color Filters, currently in the customer evaluation phase, and Printable Electronics, still in the RD development phase. Dr. Blanchet is a pioneer in the field of large area printable organic electronics. She holds about 80 patents and has authored over 100 publications.