

Recent Progress in Nonlithographic Patterning and Printing of Nano-thick Functional Materials and Devices

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Abstract

There are many applications and potentially new technologies that can stem from the use of functional organic and hybrid materials. Currently, processing and fabrication of organic-based electronic, optical, and optoelectronic materials and devices is carried by-in-large using traditional techniques such as spin coating [SC], dip coating, and vacuum thermal deposition. However, these techniques are either limited to certain substrate geometry or costly and time consuming. A tremendous advantage can be gained by incorporating printing techniques in the processing and fabrication of organic materials and devices. Printing methods such as ink jet allows not only for materials processing but also on the fly patterning. Moreover, the myriad of opportunities inkjet offers such as combinatorial optimization of some properties of polymer electrodes can be very useful in device fabrication. In this regard, We will discuss the use of combinatorial inkjet techniques to control the deposition and sheet resistivity of conducting polymers currently used in organic light-emitting devices and solar cells. With this approach a library of electrodes with various sheet resistivities can be made in few seconds, a result that is otherwise difficult, if not impossible, with traditional fabrication methods. We will present the impact of this method on actual device fabrication.

Author Biography

Ghassan E. Jabbour, Ph.D., is a Professor of Chemical and Materials Engineering and the Technical Area Leader of Optoelectronic Materials and Devices at the Flexible Display Center (FDC) at Arizona State University. He is also the Technical Advisory Board Leader on Optoelectronic Materials, Devices and Encapsulation at FDC. He has been selected to the Asahi Shimbun 100 New Leaders of the USA and he received the Presidential Award for Excellence from the Hariri Foundation in 1997. Professor Jabbour is the Associate Editor of the Journal of the Society for Information Displays (JSID). He was the Track Chair of the Nanotechnology Program for the SPIE Annual Meeting (2001-2004), and the Secretary General for the Materials Secretariat of the American Chemical Society (2001). Professor Jabbour is a guest editor for the MRS Bulletin issue on Organic Photovoltaics to appear in 2005. He is an SPIE fellow. Professor Jabbour is the chair and/or co-chair and on the committees of over 40 conferences related to photonic and electronic properties of organic materials and their applications in displays and lighting, transistors and solar cells, hybrid photosensitive materials, and hybrid integration of semiconducting materials. He has more than 300 publications, invited talks and proceedings. His work has been highlighted in national and international journals and magazines including Nature, Science, PC Magazine, Wired Magazine, LA Times, Boston Globe, Financial Times (London), USA Today, and many others. Professor Jabbour attended Northern Arizona University, the Massachusetts Institute of Technology (MIT), and the University of Arizona.