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Stencil Nano Lithography Based on a Nanoscale Polymer Shadow Mask: Towards Organic Nanoelectronics[1] SANG WOOK LEE, HOYEOL YUN, HAKSEONG KIM, KIRSTIE MCALLISTER, DONG HOON SHIN, Konkuk University, JUN SUNG KIM, POSTECH, SEUNGMOON PYO, WI HYOUNG LEE, Konkuk University, ELEANOR CAMPBELL, University of Edinburgh, NENM TEAM — A stencil lithography technique has been developed to fabricate organic-material-based electronic devices with sub-micron resolution. Suspended polymethylmethacrylate (PMMA) membranes were used as shadow masks for defining organic channels and top electrodes. Arrays of pentacene field effect transistors (FETs) with various channel lengths from 50 μm down to 500 nm were successfully produced from the same batch using this technique. Electrical transport measurements showed that the electrical contacts of all devices were stable and the normalized contact resistances were much lower than previously studied organic FETs. Scaling effects, originating from the bulk space charge current, were investigated by analyzing the channel-length-dependent mobility and hysteresis behaviors. This novel lithography method provides a reliable means for studying the fundamental transport properties of organic materials at the nanoscale as well as enabling potential applications requiring the fabrication of integrated organic nanoelectronic devices.

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