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All-Organic Nanowire Field-Effect Transistors and Complementary Inverters Fabricated by Direct Printing

박경선, 성명모

한양대학교 화학과

We generated single-crystal organic nanowire arrays using a direct printing method (liquid-bridge-mediated nanotransfer molding) that enables the simultaneous synthesis, alignment and patterning of nanowires from molecular ink solutions. Using this method, single-crystal organic nanowires can easily be synthesized by self-assembly and crystallization of organic molecules within the nanoscale channels of molds, and these nanowires can then be directly transferred to specific positions on substrates to generate nanowire arrays by a direct printing process. The position of the nanowires on complex structures is easy to adjust, because the mold is movable on the substrates before the polar liquid layer, which acts as an adhesive lubricant, is dried. Repeated application of the direct printing process can be used to produce organic nanowire-integrated electronics with two- or three-dimensional complex structures on large-area flexible substrates. This efficient manufacturing method is used to fabricate all-organic nanowire field-effect transistors that are integrated into device arrays and inverters on flexible plastic substrates.

Keywords: Organic nanowires, Directprinting, Organic electronics