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High-Performance Single-Crystal Organic Nanowire Field-Effect Transistors of Indolocarbazole Derivatives

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We report solution-processed, high-performance single-crystal organic nanowire transistors fabricated from a novel indolocarbazole (IC) derivative. The direct printing process was utilized to generate single-crystal organic nanowire arrays enabling the simultaneous synthesis, alignment and patterning of nanowires using 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. These new molecules are particularly suitable for p-channel organic field-effect transistors (OFETs) because of the high level of crystallinity usually found in IC derivatives. Selected area diffraction (SAED) and X-ray diffraction (XRD) experiments on these solution-processed nanowires showed high crystallinity. Transistors fabricated with these nanowires gave a hole mobility as high as 1.0 cm2V-1s-1 with nanowire arrays with the direct printing process.

Keywords: Single-Crystal Organic Nanowire, Field-Effect Transistors, direct printing process