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Fabrication of Organic-Inorganic Nanohybrid Semiconductors for Flexible Electronic Device

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We report a high-performance and air-stable flexible and invisible semiconductor which can be substitute for the n-type organic semiconductors. N-type organic-inorganic nanohybrid superlattices were developed for active semiconducting channel layers of thin film transistors at low temperature of 150°C by using molecular layer deposition with atomic layer deposition. In these nanohybrid superlattices, self-assembled organic layers (SAOLs) offer structural flexibility, whereas ZnO inorganic layers provide the potential for semiconducting properties, and thermal and mechanical stability. The prepared SAOLs-ZnO nanohybrid thin films exhibited good flexibility, transparent in the visible range, and excellent field effect mobility (＞7cm2/V·s) under low voltage operation (from -1 to 3V). The nanohybrid semiconductor is also compatible with pentacene in p-n junction diodes.

Keywords: Organic-inorganic nanohybrid semiconductors, Molecular layer deposition, Atomic layer deposition, ZnO, Organic thin film transistors