Nanoscopically Engineered Organic Semiconductor Thin Film for High-Performance Sensors

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The physical structure of an organic solid is strongly affected by the surface of underlying substrate. Controlling this interface has always been an important issue to improve device performance in organic electronics. Here we report an approach that utilizes an organic heterointerface to improve the crystallinity and control the morphology of organic thin film. Sequential evaporations of rubbery insulating molecule and organic semiconductor resulted in extraordinary morphology with far fewer grain boundaries and myriad nanometer-sized pores. We found that these peculiar structures are formed by difference in molecular interactions between the organic layers and the substrate surface. The macroporous organic semiconductor film exhibited higher mobility than the normal thin film, and the pore-rich structure improved the sensitivity of organic-transistor-based chemical sensors. Our approach opens a new way for the fabrication of nanostructured semiconducting layers towards high-performance organic electronics.