Synthesis and Field Effect Transistor of Covalent Organic Framework Thin Films

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2D Covalent organic frameworks (COFs), a class of porous, crystalline materials, are organic analogue of 2D inorganic materials and have drawn remarkable research interests. Layered 2D COFs feature the planar π-conjugated system and well-ordered columnar stacking arrangement, which are expected to exhibit anisotropic electrical properties. π-Stacking columns of COFs have been demonstrated to exhibit high carrier mobility, and great potential applications in electronics. Inspired by the exceptional high mobility in graphene planes, it is of great interest to sight the intrinsic carrier mobility in π-conjugated backbone of 2D COFs. However, the further understanding of the electric property of 2D COFs faces great challenges. Firstly, the insolubility of COF powders in most of solvents makes it difficult for device or electrode fabrication. Secondly, the randomly oriented microcrystals in COF powders conceals the intrinsic charge transport behaviour. Therefore, it is of highly demand to fabricate COF films with well-defined structures. We demonstrate that it is possible to fabricate COF thin film for regular field effect transistor characterization. Both planar and vertical FET based COF thin film will be presented.

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[2] B. Sun, J. Li, W. L. Dong, M.L. Wu, D. Wang, J. Phys. Chem. C 120, 14706 (2016)

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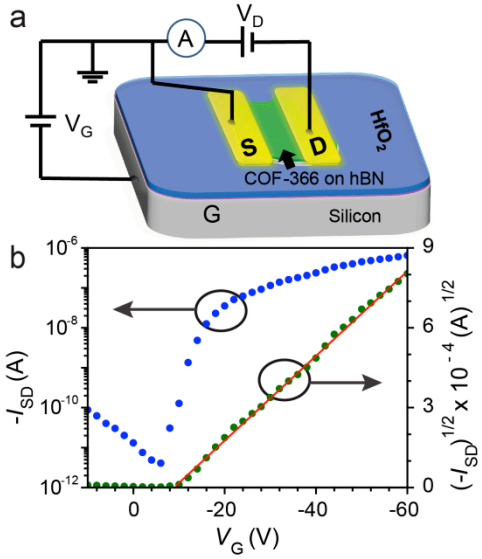

Figure 1. Device structure and Typical transfer characteristics for the COF based OFET device