Interfacial Synthesis of 2D Polymers and 2D Supramolecular Polymers

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At present, one of the key challenges faced by the scientific community is to go beyond graphene. The two-dimensional polymers and two-dimensional supramolecular polymers (2DPs and 2DSPs: laterally infinite, one atom- or monomer-unit thin, free-standing, covalent and noncovalent networks with long-range order along two orthogonal directions, respectively) have recently emerged as a new class of 2D materials and exhibit intriguing physical and chemical properties. Here, we present the bottom-up synthesis of 2DPs and 2DSPs towards large-area, free-standing feature, high crystallinity, tunable pore structures, and controllable thickness (from single-layer to multilayers) by reliable interfacial synthesis strategies (such as air/water (Figure 1), liquid/liquid interfaces) and chemistry methodologies involving of host-guest interaction, metal-dithiolene/-diimino coordination reactions, and imine/imide dynamic covalent reactions.[1-6] Notably, proof-of-concept applications of such 2DPs and 2DSPs suggest they are promising materials in energy storage and conversion, sensing, catalysis and membrane, and are expected to pay the way for the development of new generation of organic electronics.

References

[1] , X. Feng, *J. Am. Chem. Soc.* 137 (2015), 14525.
[2] R. Dong, M. Pfeffermann, H. Liang, Z. Zheng, X. Zhu, J. Zhang, X. Feng, *Angew. Chem. Int. Ed.* 54 (2015), 12058.
[3] R. Dong, Z. Zheng, D. Tranca, J. Zhang, N. Chandrasekhar, S. Liu, X. Zhuang, G. Seifert, X. Feng, *Chem. Eur. J.* 23 (2017), 2255.
[4] H. Sahabudeen, H. Qi, B. A. Glatz, D. Tranca, R. Dong, Y. Hou, T. Zhang, C. Kuttner, T. Lehnert, G. Seifert, U. Kaiser, A. Fery, Z. Zheng, X. Feng, *Nat. Commun.* 7 (2016), 13461.
[5] S. Liu, J. Zhang, R. Dong, P. Gordiichuk, T. Zhang, X. Zhuang, Y. Mai, F. Liu, A. Herrmann, X. Feng, *Angew. Chem. Int. Ed.* 55 (2016), 12516.
[6] S. Liu, F. Wang, R. Dong, T. Zhang, J. Zhang, X. Zhuang, Y. Mai, X. Feng, *Adv. Mater.* 28 (2016), 8365.

Figures

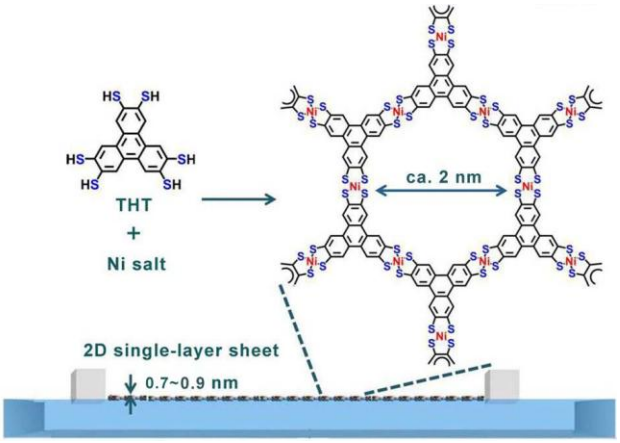

Figure 1. Schematic illustration of bottom-up synthesis of graphene-like 2DSP at air/water interface.