SELF-ASSEMBLY OF METAL ORGANIC FRAMEWORKS ON 2D SOLID TEMPLATES

Kalinina M.A., Sokolov M.R., Zvyagina A.I., Meshkov I.N., Nugmanova A.G., Enakieva Y.Yu.

A.N. Frumkin Institute of Physical Chemistry and Electrochemistry, RAS, Leninsky prospekt 31b4, Moscow, 119071, Russia, e-mail: zvyagina.ai@gmail.com.

Substrate-mediated self-assembly is a new strategy which exploits surface effects for tailoring solid surfaces with well-defined supramolecular and hybrid assemblies presenting various functionalities. Herein, we discuss several examples enlightening the application of this concept to the fabrication of stable surface-attached metal organic frameworks (SURMOFs) as films on planar solid supports as well as on dispersed solid particles. We showed that SURMOFs can be assembled from variously substituted zinc porphyrins or PDI derivatives as linkers on surfaces, decorated with graphene oxide (GO). (Fig.1a) Another new approach was used to fabricate catalytically active supramolecular hybrids on colloidal templates. We describe two types of the SURMOF-based catalysts: (i) the porphyrin-based SURMOF/GO composites obtained in the Pickering emulsions, and (ii) a synergetic catalyst assembled from ZnTCPP and zinc acetate on the particles of layered europium hydroxochloride as anion-exchange 2D template.(Fig.1b) We showed how to apply a combination of methods including MALDI-TOF spectroscopy for understanding the origin of synergetic effects and the mechanisms of catalysis in these solid-associated supramolecular hybrids.

We believe that our strategies provide a basis for new types of self-assembled coordination structures on solid matrices suitable for their integration with modern planar technologies in chemical sensing, optics, molecular electronics and catalysis.

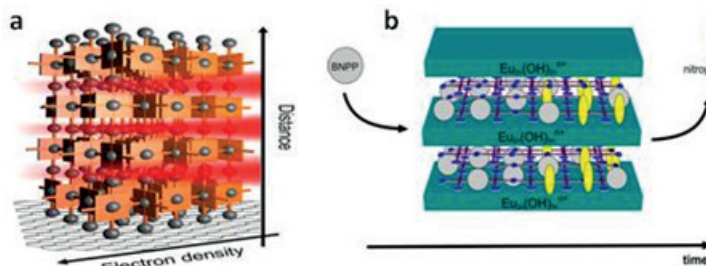

Figure 1. Schematically illustrated (a) structure and distribution of electron density in the SURMOF on the GO-decorated surface and (b) mechanism of the hydrolysis of BNPP catalyzed by the SURMOF-hybrid in acidic solution.

The work was supported by RFBR (grant 18-29-04026-MK) and the Ministry of Science and High Education RF.