METAL-ORGANIC FRAMEWORKS AS MATRICES FOR MASS SPECTROMETRY OF BIOMOLECULES

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Metal-Organic Frameworks (MOFs) belong among new hybrid nanomaterials with porous structure consisting of a framework of metal ions and organic ligands. These coordination polymers with unique properties, such as large surface area, tunable pore size, high porosity and high absorption capability in UV-visible range, make MOFs very prospective material in many diverse applications like adsorption of dyes, gas storage, gas separation, catalysis, drug storage and delivery, imaging, sensing, and as matrices in mass spectrometry [1, 2].

In this work, possibilities of MOFs, e.g. benzene-tricarboxylic acid and Cu^{2+} ions framework (HKUST-1, Fig. 1), to be used as possible matrices for mass spectrometry of various kinds of molecules from a simple (retinoic acid) to complex (peptides/proteins of mouse embryonic fibroblast) were examined. Either MOFs alone or in combination with classical MALDI matrices like dihydroxybenzoic acid, gold nanoparticles or other nanoparticles were extensively studied for Matrix and Surface Assisted Laser Desorption Ionization (MALDI and SALDI).

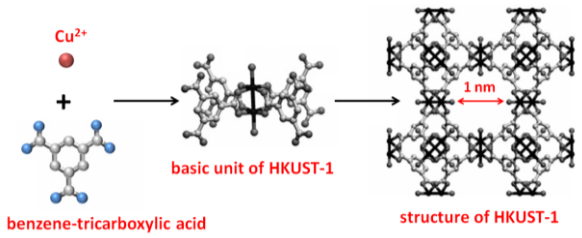

Fig. 1 Synthesis of HKUST-1(adapted from [3])

It was found that, HKUST-1 is capable of increasing the ionization and MS detection of simple organic and/or various bio-molecules. The use of MOFs presents several advantages, including lower interference of background, salt tolerance, high sensitivity and reproducibility. Further potential use MOFs might be as a concentration probe and/or staining agents, for example.

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