New Al-based microcrystalline Metal-Organic Nanosheets (MONs) as efficient fluorescent sensor for Fe(III) in water

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Metal-Organic Frameworks (MOFs) and coordination polymers (CPs) are crystalline materials which have received a growing interest. In the last years, the research in this field has been focused on the isolation of a new class of 2D materials, known as Metal-Organic Nanosheets (MONs) [1]. They consist of two-dimensional layers with nanometric thickness, which are characterized by great chemical variability and high flexibility. Their high surface area and the great number of exposed active sites allow them to be applied in catalysis, sensing, gas adsorption and energy storage among others, outperforming the most common 2D bulk materials.
In our search to isolate new MONs starting from already known 2D CPs, we selected a layered Al-based CP (refcode: WAKHAU, known also as CAU-15) [2] (fig. a) from Cambridge Structural Database (CSD) following specific criteria of exfoliation, such as the presence of weak interaction along the stacking direction and a high interlayer distance. The corresponding 2D exfoliated material, obtained by solvent-assisted sonication method, has been characterized by Tyndall effect, X-ray powder diffraction, high-resolution transmission electron microscopy (HR-TEM) (fig. b), and photoluminescence spectroscopy. In the bulk solid-state CAU-15 shows an emission centered at 340 nm. Its colloidal suspensions in water evidence a solvent-dependent emission and a shift of the emission maximum to 320 nm. To study the sensing ability of CAU15- Ns toward metal ions, the emission properties of its colloidal solution in water in the presence of selected metal ions have been investigated (fig. c). A slight quenching effect is observed for all the investigated metal ions except for Fe(III), which gives a remarkable lowering of the fluorescence on increasing its concentration in solution. CAU15- Ns is then an efficient and selective fluorescent sensor for Fe(III).

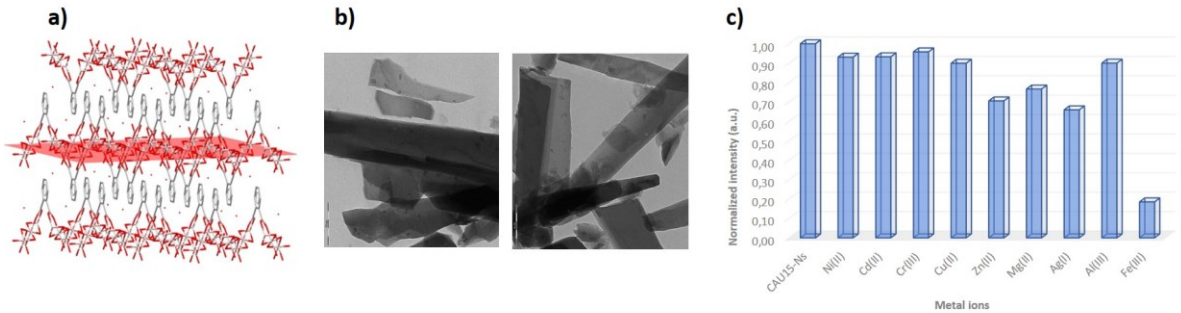

Figure 1-a) WAKHAU layered structure; b) CAU-Ns HR-TEM images; c) metal ions effect on the emission of the CAU-15Ns aqueous colloidal suspension

References

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