Invited speaker

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Incorporation of Curcuminoid Ligands into different Materials

Development of novel ligands with optical properties and active sites for enhancing the sensing properties of materials has always been a challenge. The formation of nanostructures with these organic ligands can increase the sensitivity and selectivity of the resulting sensing platforms. Examples are reported of nanostructures formed by the combination of organic ligands with metal ions, resulting in crystalline materials such as Metal Organic Frameworks (MOF) or Coordination Polymers (PC). The ability to understand the interaction of the organic molecule with the metal ions or clusters, allows not only to comprehend the structural or functional properties of these molecular material, but also can be used to understand the selectivity or sensitivity during the sensing process.

Curcuminoid molecules (CCMoids) are conjugated organic ligands, which have been reported to behave as colorimetric and fluorometric chemosensors [1]. Their structure is composed of a conjugated carbon chain, with a central -diketone group able to coordinate metal ions, and two terminal aromatic rings which can be designed with different donor or acceptor groups, changing their electronic properties. The first, and most well-known curcuminoid molecule, is the curcumin [2], which is a natural organic ligand, that exhibits inherent fluorescence. It has been reported as a standardized dye for the detection of boron in irrigation water, or when coordinated with a BF2 group (CRANAD-1), it has been reported as a fluorometric probe for the detection in the Alzheimer Disease (AD). Several curcuminoid molecules have also been reported for the detection of other metal or organic molecules [3]. Some examples have also been reported of curcuminoid ligands as part of a CP [4], and only in the case of the ligand curcumin, a MOF has been reported for biomedical applications [5].

In our group we prepare different curcuminoid ligands, study their properties and try to incorporation them on materials, with the goal to prepare optical materials for detection studies. The preparation of the materials with curcuminoid ligands follow three different research lines: (i) CCMoid functionalization on different surfaces such as Si or cellulose to see how the anchoring to the surfaces can help on the properties of the hybrid material; (ii) CCMoid functionalization on nanoparticles, such as Au or SiO2, to see the effect of the NP on the properties of the hybrid material; and (iii) consider the CCMoid molecules as building blocks for the preparation of PC or MOFs, to study its structure and possible active sites for sensing. Depending on the direction of the project, the structure of the curcuminoid molecule can be modified, incorporating a central chain for their functionalization on surfaces or incorporating terminal carboxylate groups to form different frameworks. In this work, will be presented the different research attempts to incorporate curcuminoid ligands on materials.

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