Coordination polymers as a source of functional nanomaterials

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Abstract

Coordination polymers, also named metal-organic frameworks (MOF), are infinite aggregates of metal ions bridged by organic ligands.[1] They self-assemble by coordination bonding in one, two or three dimensions (1D, 2D and 3D). The key aspect to the design of a desirable polymer architecture and its dimension is the selection of the molecular building blocks, which also determines the properties of the resulting materials. Among other functions, these compounds form porous materials and polymer magnets, and they can show chromism, nonlinear optical properties, redox properties and electrical conduction.[2, 3] Most of the studies concerning these properties and potentials application have been carried out at the macroscale. These features have prompted studies focused on the development of suitable strategies towards their processability as nanomaterials.[4-6]

In this talk several aspects concerning the formation of nanomaterials based on coordination polymers of different dimensionalities will be summarized. By means of some selected examples we will show several strategies that have allowed processability to produce 0D, 1D and 2D nanomaterials. Particular attention will be paid to the potential use as molecular wires of electrical conductive 1D nanostructures formed on insulated surfaces (Figure 1),[7] and 2D nanomaterials isolated on surfaces as alternative materials to graphene (Figure 2)[8].

References

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Figures

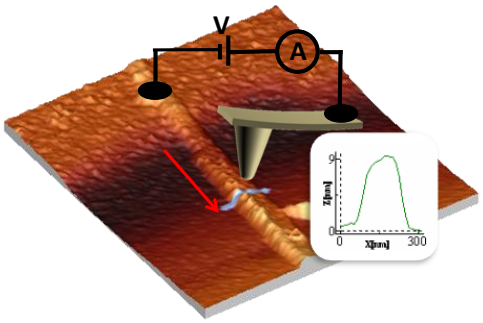

Figura 1. Electrical characterization of MMX nanoribbons using conductance AFM. AFM topography showing an MMX nanoribbon adsorbed on SiO_2 and electrically connected to a gold electrode. The nanoribbon is partially covered with gold and the protrusion observed on the gold electrode reflects the topography of the nanoribbon. For clarity, the scheme of the electrical circuit used in the AFM conductance experiments has been added to the AFM image.

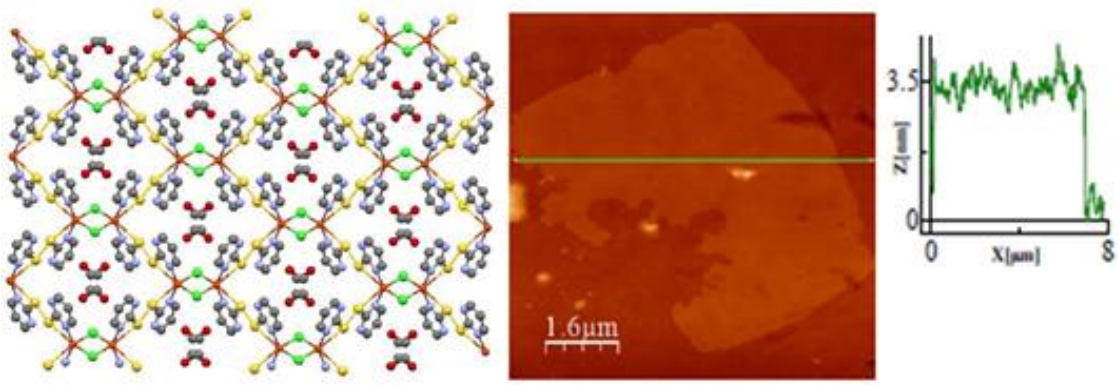

Figura 2. Structure of $[Cu(pymS_2)Cl{\bullet}MeOH]_n$ ($pymS_2$=pyrimidine disulfide). AFM image of a single layer of 5x5 micron length deposited on SiO2 (F. Zamora, work in progress).