SHAPING OF COORDINATION COMPOUNDS AS THIN FILMS FOR THE DEVELOPMENT OF NEW DEVICES

My research career started in 2009 with the beginning of my PhD with at the Coordination Chemistry Group (University of Valencia), under the direction of Professor Francisco Lloret Pastor and Doctor Juan Cano Boquera.

During my PhD, my research work focused in the synthesis and characterization of different coordination compounds such as metal-organic clusters (MOCs) or frameworks (MOFs), by combining different organic molecules and transition metal ions. A very important part of the work was the study of their properties, which define them as Multifunctional Molecular Magnetic Materials and make them become very promising compounds with potential applications in emerging fields like Materials Science. Some of these properties are the storage of information, reversible molecular separation, catalysis, etc.

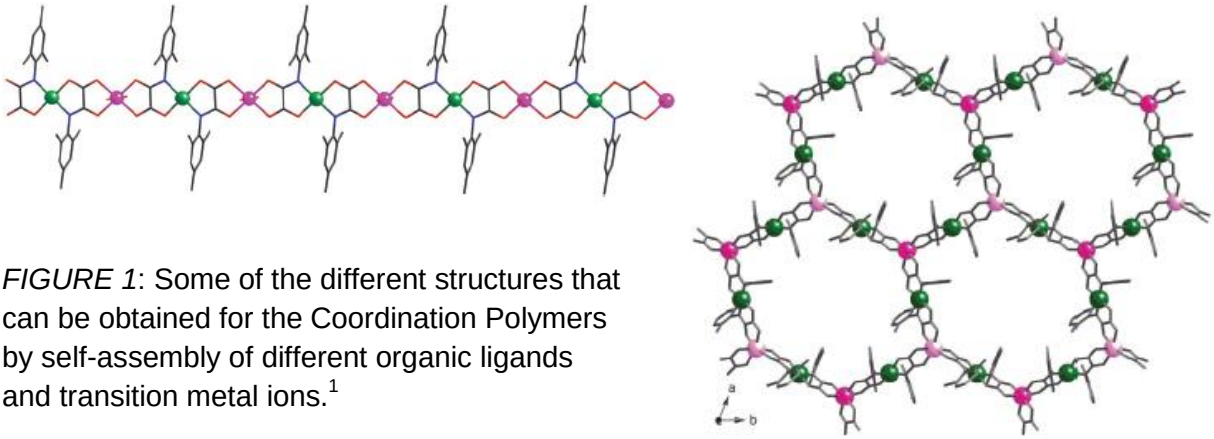

FIGURE 1: Some of the different structures that can be obtained for the Coordination Polymers by self-assembly of different organic ligands and transition metal ions.[1]

In this PhD work, the previously described compounds were just synthesized as microcrystalline powders. Nevertheless, to take advantage of their properties and integrate them in devices, their shaping as thin films over surfaces it is required. Only like that all their potential applications can finally and happily come true, moving thus from fundamental science to technological applications.

Apart from that, this shaping opens a new way to the study of molecular architectural chemistry over surfaces, providing a further knowledge of the generation of films mechanisms over different substrates.

This is one of the reasons why, after getting my PhD in 2013, I decided to start my postdoctoral formation working on a project in the area of Materials Science, under the supervision of the researchers Catherine Henry de Villeneuve and Philippe Allongue, at PMC

Laboratory, in collaboration with the Laboratory of Porous Solids (Institute Lavoisier of Versailles, UVSQ). My work was focused on the shaping as thin films of different Metal Organic Frameworks over silicon surfaces with different kinds of functionalization[2]. It provided both a deep understanding of the growth mechanisms of thin films and an evidence of the differences observed between bulk and nanostructured same material. This work was inspired by Lili Lu's PhD[3] (who worked in the preparation of thin films of Prussian Blue Analogues over functionalized silicon surfaces), and further successful research on it is being carried out by Hongye Yuan, who is doing his PhD in this topic.

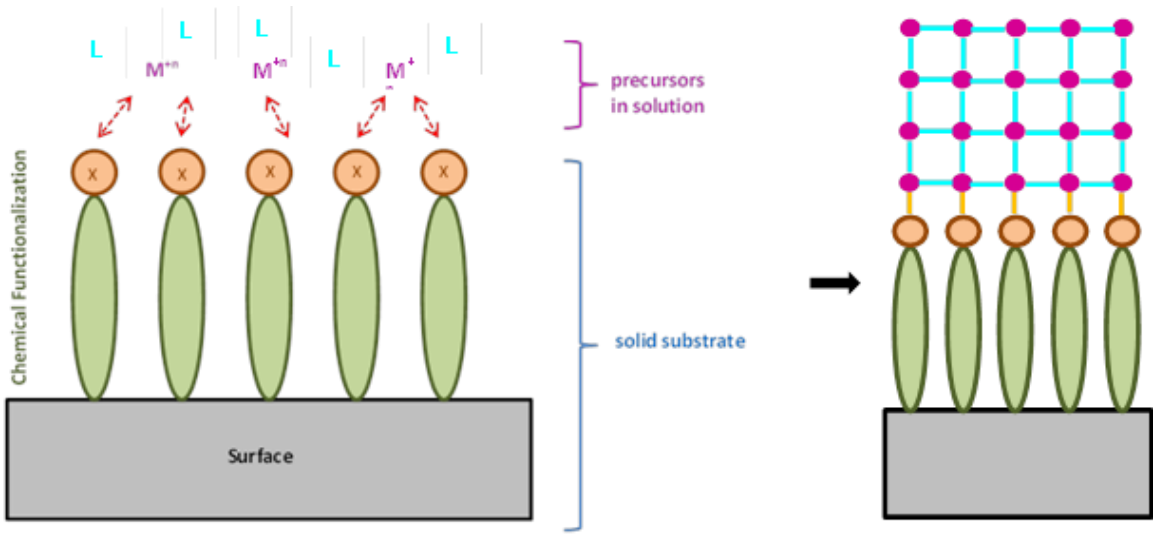

FIGURE 2: General schema of the beginning of the growth of a coordination compound thin film over functionalized surfaces via formation of chemical bonds (stable, strong and well-addressed)

In June 2015, to be a bit "back to the origins", I got a postdoctoral grant from the Generalitat Valenciana to continue the line of work started in my first postdoc, but this time trying to shape as thin films the coordination compounds I worked with during my PhD. I am currently carrying out this project at PMC Laboratory, in collaboration with the Coordination Chemistry Group of University of Valencia.

[1] Grancha, T., Ferrando-Soria, J., Castellano, M., Julve, M., Pasán, J., Armentano, D., & Pardo, E. (2014). Oxamato-based coordination polymers: recent advances in multifunctional magnetic materials. *Chemical Communications*, *50*(57), 7569-7585.

[2] Faucheux, A., Gouget-Laemmel, A. C., Henry de Villeneuve, C., Boukherroub, R., Ozanam, F., Allongue, P., & Chazalviel, J. N. (2006). Well-defined carboxyl-terminated alkyl monolayers grafted onto H-Si (111): packing density from a combined AFM and quantitative IR study. *Langmuir*, *22*(1), 153-162.

[3] « *Thin Films Based on Prussian Blue Analogues: Growth Mechanism and Physical Properties* » - thesis by L. Lu, Ecole Polytechnique (Palaiseau, France), 2014.

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