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Tuning the 1D-2D dimensionality upon ligand exchange in silver thiolate coordination polymers with photoemission switch

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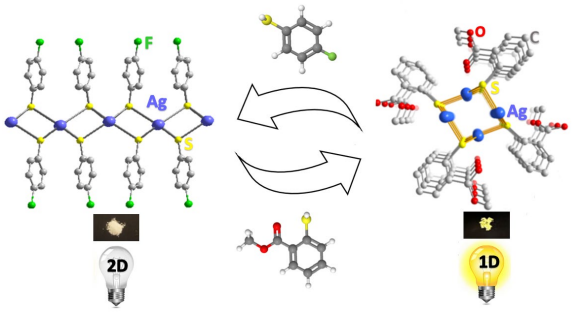

Hybrid materials with thiolate-based ligands and d^{10} coinage metals (M(I) = Cu, Ag and Au) are known for a long time mainly in the domains of biology and pharmaceutics.[1] Indeed, in our daily life, silver nanoparticles are wildly used as biocides, for their microbial activity, in textiles, food packaging, drink water and medical devices such as pads.[2] The biocidal activity is due to the high toxicity of Ag(I) ions that are released from silver nanoparticles. Thus, during their life cycle, silver nanoparticles, and more particularly Ag(I) soluble species, are dispersed in the environment where they are subjected to various reactions throughout the cells in bacteria, plants or animals with different toxic potentials. While Ag(I) is an unphysiological ion, it shows, as the physiological Cu(I) ion, which are both soft acids, high binding affinity for thiolate ligands, which are soft bases. Thiol-based molecules present in cells are mainly glutathione and metallothionein, which are important proteins involved in cellular copper homeostasis. Consequently, it has been proposed that the toxicity of Ag(I) ions in cells is due to their ability to easily bond to thiol biomolecules and replace Cu(I) in their native binding sites. In this study we focused on the chemical stability of Ag(I)-thiolate and more importantly their ability to thiolate ligand exchange, which may be a way of Ag(I) to enter in a cell in a biota. Here the synthesis and structure of two new 2D silver thiolate coordination polymers (CP) are presented $[Ag(p\text{-}SPhF)]_n$ and $[Ag(p\text{-}SPhCl)]_n$ and the studies of their stability in basic and acidic media are presented. More importantly, we showed that in presence of a thiol excess, the ester *o*-$HSPhCO_2Me$, this 2D CP is dissolved and recrystallized in a 1D network that exhibits an intense photoemission. This study confirms that Ag(I) has strong affinity with thiol molecules and while silver-thiolate compounds are highly stable, they can undergo thiol-ligand exchange, that could be a mechanism to enter onto a cell.

[1] Veselska, O. & Demessence, A. (2018), *Coord. Chem. Rev* 355, 240.

[2] K. Chaloupka, Y. Malam & A. M. Seifalian (2010), *Trends in Biotechnology* 28, 580-588.