Aurophilic Luminescent Hydrogels

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BACKGROUND

João Lima is specialized in molecular photophysics and photochemistry, time-resolved and steady state absorption and emission spectroscopy. Research interests in photochemical sensors and actuators, light energy conversion, photo-oxidation, DSSC's, stimuli controled molecular assembly and rehology.

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ABSTRACT

Metallogels are a subject of study in the last few years.[1] The reason for the growth of interest stems from the availability and the diversity of metal-ligand coordination that could readily induce or control the self-assembly process of the gel formation and thereby influence the gel properties, as a difference with what occurs in organic gels. Organometallic Au(I) complexes present the additional advantage to use both classical supramolecular interactions (e.g. p-p stacking or hydrogen bonding) together with the establishment of Au(I)···Au(I) bonds (aurophilic interactions), which are particularly strong. Furthermore, these complexes exhibit interesting emissive properties that usually are modulated by the presence of the aurophilic interactions, display sup-picosecond intersystem crossing rate constants[2] and can display thermally assisted delayed fluorescence (TADF) with short luminescence decay times and a high PL quantum efficiency[3], important properties for OLED emitters.

We have reported on the formation of luminescent Au(I) hydrogels based on water soluble organometallic alkynyl complexes where aurophilic intermolecular interactions are involved on the gelation process.[4-8] Slight modifications on the chemical structure can induce significant changes on the supramolecular assemblies leading to hydrogels, rods or vesicles (Fig. 1).

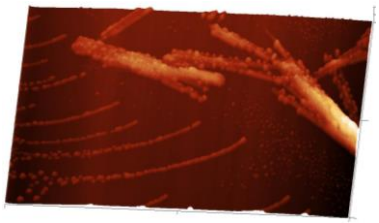

Fig. 1: AFM image showing the hierarchical self-assembly from vesicles to fibers and bundles of [(PTA)Au(4-pyridylethynyl)] in water (PTA = 1,3,5-triaza-7-phosphaadamantane).

Analysis of the thermodynamic and photophysical parameters that modulate and are modulated, respectively, by Au(I) and Au(I)...Au(I) interactions has been performed and the results are supported by theoretical data.

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