Fluorescent Silica Nanoparticles with Multivalent Inhibitory Effects towards Carbonic Anhydrases

Briefly, how would you describe your research?

Our research is currently focused on the design and engineering of multivalent systems for the inhibition of relevant enzymes involved in various pathologies, such as cancer.

What is the most significant result of this study?

Multivalency can have intriguing effects. Usually the simultaneous presentation of several ligands or inhibitors enhances the interaction with its biological target. In this work we demonstrate that multivalency not only increases the inhibitory potency against carbonic anhydrases, but also affects the selectivity between different isoforms. By enabling the targeting of a specific isoform, the design of multivalent nanoconstructs becomes an interesting strategy in the inhibition of metalloenzymes of therapeutic interest.

What prompted you to investigate this topic?

From a therapeutic perspective, carbonic anhydrases have been validated as drug targets for different pathologies such as glaucoma, epilepsy, and recently cancer. Different isoforms are involved in these diseases and one of the main clinical limitations in the use of carbonic anhydrase inhibitors is the lack of selectivity. The current challenge is to design selective potent inhibitors and the use of inhibitor-coated nanoplatforms could be an important method in reaching this goal.