CHROMOGENIC SENSING DETECTION IN FUNCTIONALIZED POROUS SILICA.

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A large amount of work has been devoted to the study of the inclusion of organic dyes into porous solids and have been extensively studied for applications such as, second-harmonic generation, solid-state lasers, photocatalysis, etc. due to their large surface area, mechanical strength, and homogeneous pore distributions [1]. Recently few reports have appeared related to their use in sensing protocols [2]. The possibility of combining predefined, selective, chemical binding centres with selected physical properties of these solids might lead to promising multifunctional materials for new mesoscopic-scale-based recognition processes.

In this work we combine different research fields such as chromogenic sensing and solid-state chemistry in the quest to develop systems for enhanced colorimetric discrimination of very similar guest species. The framework zeolite beta was selected as a microporous hybrid material and the UVM-7 as a mesoporous hybrid material [3,4]. Two methodologies have been developed for the use of these materials in sensing protocols. One is the chemodosimeter approach, which is related to the use of guest-induced irreversible reactions, and the other is the displacement protocol, which also involves the use of a binding site and a signalling reporter, although here the two subunits are not covalently attached but form a molecular ensemble.

The protocol we have developed to anchor dyes is based on the inclusion of organic dye precursors in the synthesis gel to obtain, after the extraction of the structure-directing agents (SDA), microporous or mesoporous material derivatives containing covalently bonded organic groups on the pore walls. For displacement protocol, suitable nanosized pores are functionalized with appropriate binding sites. The functionalized solid is then loaded with a dye capable of coordinative interaction with the anchored coordination sites. In the presence of a target anion displacement of the dye into the solution is achieved and results in colorimetric detection of the guest [6].

By using new solid-state supramolecular chemistry protocols, we have demonstrated that employing hybrid materials as solid hosts might lead to new sensor materials that allow to visibly discriminate selected target guests by the solid structure itself that is capable of discriminating the shape-selectivity, polarity, and size of the guest.

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