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FACULDADE DE CIÊNCIAS E TECNOLOGIA UNIVERSIDADE NOVA DE LISBOA

Department of Chemistry

Novel Photochromic hybrid materials

REQUIMTE / Photochemistry and Supramolecular Chemistry Research Team

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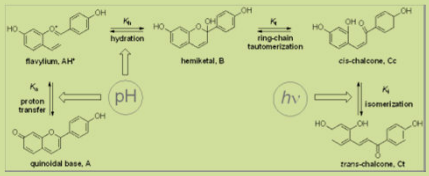
Objectives

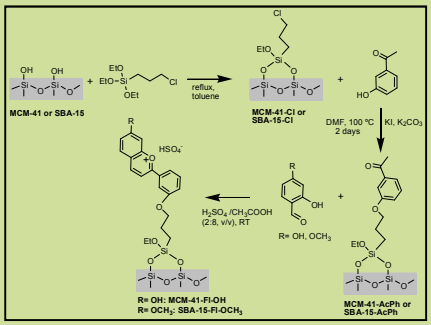
The goal of this work is to develop new photochromic hybrid materials containing 2-hydroxychalcones as the photoactive species covalently attached or encapsulated in the matrices. Hybrid materials combine the advantages of both organic (flexibility, versatility, etc.) and inorganic (high thermal stability and mechanical resistance) worlds, which allow the preparation of new functional materials suitable for applications in catalysis, solid electrolytes, optics and biomedicine. Particularly interesting are the photochromic hybrid materials due to their potential application as optical memories, photoactive devices, smart windows and decorations.



Scheme 1. Chemical reaction network established in solution by flavylium cations, exemplified for 4',7-dihydroxyflavylium.

Methodology

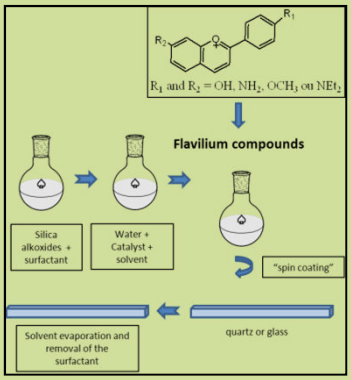
2-Hydroxychalcones can either be synthesized directly or obtained in basic medium from equilibrated solutions of flavylium systems. These molecules are responsible for the bright colours of flowers, fruits and leaves and found applications in the food, and cosmetic industries, and even as light absorbers in solar cells aiming at a greener solar energy conversion. Their photochromic properties are consequence of the *cis-trans* photo-induced isomerization. Depending on the pH, irradiation of a *trans*-2-hydroxychalcone can lead to the *cis* isomer and subsequently to the flavylium cation (Scheme 1).
In order to obtain hybrids for practical applications based on this systems, several materials as mesoporous silicates (Scheme 2), zeolites and biopolymers (as starch) are being explored as supports in the forms of powders or thin films (Scheme 3).



Scheme 2. Synthetic strategy leading to the hybrid materials based on silica mesoporous materials (MCM-41 and SBA-15) with covalently attached flavylium compounds.

Expected Results

The new hybrids should behave as pH-dependent photochromic materials with higher stability than the homogenous systems. The influence of different supports with several pore sizes, polarity and acidity, as well the method used for the design of the hybrids, on the stability of 2-hydroxychalcone and their photochemistry will be studied in detailed in order to get new functional materials for practical applications.



Scheme 3. Approach to obtain hybrid materials as thin films with entrapped flavylium compounds in the matrices.

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