Fluorescent hybrid materials based on 3-Hidroxyflavone as optical sensors for pH

Fabiano da Silveira Santos* (PG), Fabiano Severo Rodembusch (PQ)

fabiano@ufrgs.br

Grupo de Pesquisa em Fotoquímica Orgânica Aplicada, Instituto de Química, Universidade Federal do Rio Grande do Sul. Avenida Bento Gonçalves, 9500. CEP 91501-970. Porto Alegre, RS, Brasil.

Palavras Chave: *flavone, fluorescence, colorimetric, fluorimetric.*

Introdução

3-Hidroxyflavone (3HF) shows photochemical and photophysical stability, as well as large Stokes' shift due to tautomeric forms resulting from excited state intramolecular proton transfer mechanism (ESIPT).

(3HF)

Due to this mechanism, these fluorophores can exhibit strong solvent and/or pH dependent photophysics.[1,2] In this way, this work investigates the colorimetric and fluorimetric behavior of a hybrid material doped with 3HF against changes in pH.

Resultados e Discussão

The 3HF was synthetized according to the literature.[3] The hybrid material was obtained by sol-gel method with 100 and 55% tetraethylortosilicate (TEOS)/dimethyldimethoxysilane (DDMS) molar ratio using HCl as catalyst. An ethanolic solution of 3HF was added during the sol-gel procedure.[4] Saturated chambers with vapors of ammonium hydroxide or hydrochloric acid were used to study the pH dependence of the obtained hybrid materials.

Before vapor exposition (blank curves), from diffuse reflectance UV-Vis, it was observed an absorption maxima located around 350 nm for both 55% and 100% TEOS (**Figure 1**). No significative changes were observed in acidic pH. In basic pH, the maxima shifts to 390 nm for the hybrid 100% TEOS.

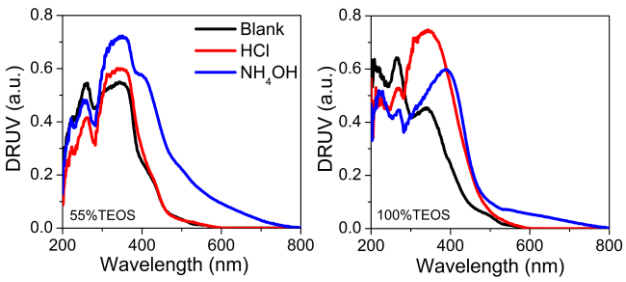

Figure 1. Diffuse reflectance UV-Vis of hybrid materials before (blank) and after exposition to acidic and basic vapors.

Concerning the fluorescence emission (**Figure 2**), the hybrid material 55% TEOS present a main band located in the green region (~520 nm). In both acidic and basic pH, the fluorescence emission was quenched, which can be useful for on/off fluorimetric sensors, mainly in acidic pH.

The blank sample 100% TEOS shows a dual fluorescence (~430 and 506 nm). The hybrid material also changes the fluorescence spectra after vapor exposition, as follows: (i) HCl: a more intense main fluorescence band located around 441 nm and (ii) NH_4OH: a single less intense fluorescence band located around 492 nm. The observed previous results indicate that these hybrid materials can be useful as ratiomeric optical sensors.

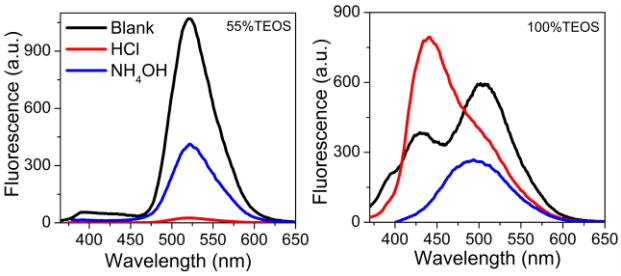

Figure 2. Fluorescence emission spectra of hybrid materials before (blank) and after exposition to acidic and basic vapors.

Conclusões

In summary, the photophysics of hybrid materials doped with 3HF was studied in order to investigate their potential application as optical sensors for pH. The results indicate that both hybrid materials are potential sensors for acidic pH, where in the 55% TEOS the HCl quenches the fluorescence emission, indicating a potential application as on/off fluorimetric sensor.

Agradecimentos

CNPq e INDI-Saúde.

[1] J. S. Wu, *et al. Chem. Soc. Rev.*, **2011**, *40*, 3483.
[2] J. E. Kwon, S.Y. Park, *Adv. Mater.*, **2011**, *23*, 3615.
[3] A. S. Klymchenko, *et al. J. Am. Chem. Soc.*, **2002**, *124*, 12372.
[4] S. R. Grando, F. S. Santos, *et al. J. Sol-Gel Sci. Technol.*, **2012**, *63*, 235.