Singlefluoroforic Submicro-Sized Silica Particles

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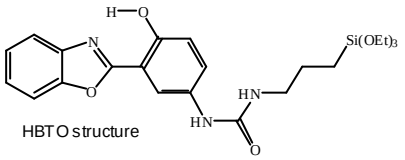
Introduction

The need for well-defined fluorescent silica particles has increased in the last years due to their potential application as optical, biological sensors and in multifluoroforic systems, due to their photophysical characteristics.[1,2] These systems behave as nanodevices that are able to perform predefined functions in a very effective way. This work presents for the first time a simple methodology using sol-gel technique to obtain a singlefluoroforic system that shows a fluorescence emission modulated by the excitation wavelength and a large Stokes shift. In order to prepare this system, a highly fluorescent silyl functionalized benzoxazole dye (HBTO) was used as a fluorescent probe.[3]



HBTO structure

Results and Discussion

The fluorescent silica particles were prepared by solubilisation of HBTO in TEOS, in ethanol as a solvent, followed by the addition of ammonium hydroxide (10% v/v), and the surfactant TWEEN 80®, under magnetic stirring. After one hour, the precipitate was filtered, washed twice with chloroform and ethanol yielding well defined and homogenized spheres (Figure 1).

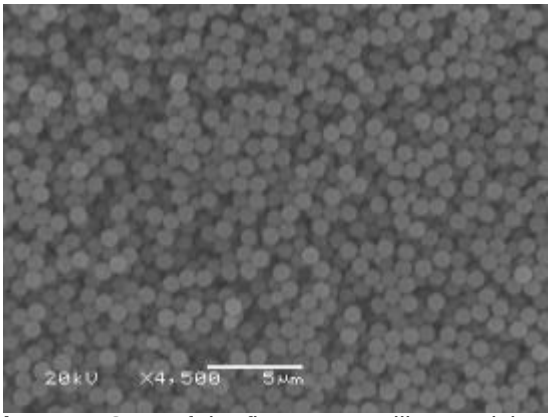


Figure 1. SEM of the fluorescent silica particles.

The particles are fluorescent in the blue-green region depending on the excitation wavelength (Figure 2).

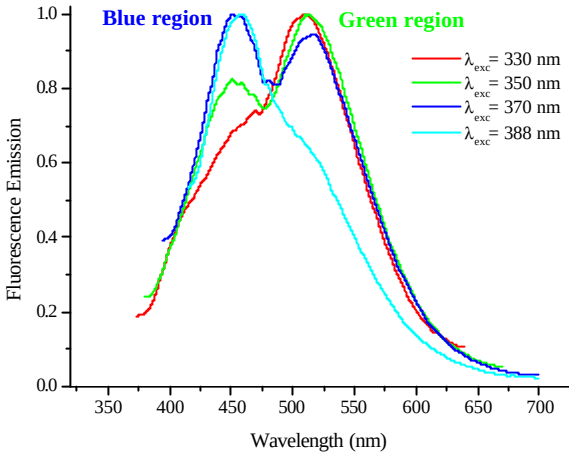


Figure 2. Normalized solid-state fluorescence emission spectra of the submicro silica particles.

At a lower excitation wavelength (330 nm), the particles present a green emission, located at 512 nm, with a Stokes shift of 182 nm (10772 cm^{-1}). However, at a higher wavelength (388 nm), a blue emission located at 458 nm, with Stokes shift of 70 nm (3939 cm^{-1}), can be observed indicating a fluorescence modulation. In addition, the large Stokes shift does not allow the energy transfer, hindering the interaction between the fluorescent species.

Conclusions

New submicro fluorescent silica particles were prepared by the sol-gel methodology. The morphology and homogeneity of the particles allied with the observed fluorescence emission modulation and the absence of energy transfer opens up new perspectives in the application of these fluorescent particles in the field of nanosensors and devices.

Acknowledgements

CNPq, CAPES e FAPERGS

[1] Wang, L., Yang, C., Tan, W. *Nano Letters* **2005**, *5*, 37-43.
[2] Montalti, M., et al. *Langmuir* **2004**, *20*, 2989-2991.
[3] Campo, L. F., Sánchez, F., Stefani, V. J. *Photochem. Photobiol. A: Chem*. **2006**, *178*(1), 26-32. (b) Rodembusch, F. S., Campo, L. F., Rigacci, A., Stefani, V. *J. Mater. Chem*. **2005**, *15*, 1537-1541.