NANOFUNCTIONAL MESOPOROUS FILMS WITH PHOTO-OXIDATIVE PROPERTIES

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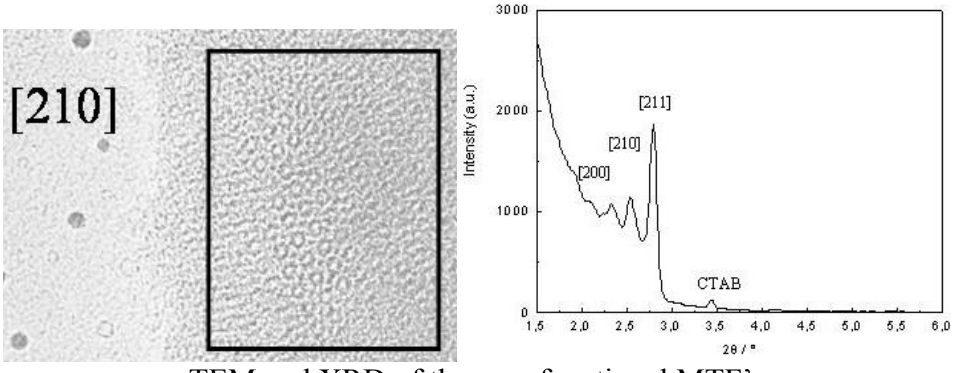
The photochemical generation under mild conditions of the first excited singlet state of oxygen (O2 ($^1\Delta g$) or $^1O_2$) is still a highly relevant topic for many applications, including photodynamic therapy, photodegradation, photooxidation of fine chemicals... Photosensitization is the most common way for producing $^1O_2$ under visible light conditions via energy transfer mechanism with an organic photosensitizer. It was previously shown[1] that hybrid monoliths materials were efficient for the oxidation of nauseous pollutants in the gas phase. $^1O_2$ lifetime and quantum yield could be determined at the gas solid interface, and the correlation between singlet oxygen production and oxidative properties was studied.[2]

In this work, an original organic photosensitizer was incorportated into Mesostructured Thin Films (MTFs) and the oxidative properties of the resultant nanofunctional hybrid films were successfully tested.

Functional MTFs were obtained using a sol-gel method either *via* a "one-pot" procedure (with a sylilated photosensitizer) or via a combined approach (*i.e.* "one-pot" synthesis with an aminopropyltriethoxysilane followed by a chemical post-modification with a carboxylic derivative of the photosensitizer). They were fully characterized by TEM, ellipsoporosimetry, XRD and electronic spectroscopy.

The photo-oxidative properties of functionalized MTFs were successfully tested through the oxidation reaction of two well-known pollutants particularly sensitive to singlet oxygen: dimethylsulfide (DMS) and dibutylsulfide (DBS). The formation of sulfoxide and sulfone was observed for both.

In summary, PS containing MTF's were prepared and characterized, and their photo-oxidative activity was demonstrated. Further work aimed at the determination of $^1O_2$ quantum yield and lifetime inside the film, depending on various surface modifications, will be undertaken in a near future.



TEM and XRD of the nanofunctional MTF's

1 C. Cantau, T. Pigot, R. Brown, P. Mocho, M. T. Maurette, F. Benoit-Marqué, S. Lacombe, *Appl. Catal. B: Environ*., 65, 77-85, (**2006**).
2 C. Cantau, T. Pigot, N. Manoj, E. Oliveros, S. Lacombe, *Chemphyschem,* 8, 2344-2353 (**2007**).