Luminescent hexagonal ordered mesoporous Eu:SiO_2

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Luminescent Eu:SiO_2 hexagonal ordered mesoporous powders, SBA-15 type [1], containing Eu were obtained by one pot synthesis method using the triblock copolymer Pluronic P123 as structure directing agent, tetraethyl orthosilicate (TEOS) as the silicon source, and europium nitrate. Calcination with different procedures and temperatures were tested in order to remove the polymeric template. Samples with two different nominal Eu content were analyzed, 3 and 10 at.% in the silica matrix. The Small Angle X-Ray Scattering (SAXS) results revealed that a bi-dimensional hexagonal ordered mesoporous structure is formed in as-synthesized samples and it is preserved after calcination to remove the polymer, as shown in Figure 1. The increase of the calcination temperature from 540 ^{o}C to 650 ^{o}C, necessary to remove the carbon residues, promotes a decrease of the lattice parameter, which is around 12 nm. The nitrogen sorption results were used to determine the superficial area, mean pore diameter and pore volume of the materials calcined at 650 ^{o}C. A typical BET surface area around 450 m^2/g, a pore volume of 1.5 cm^3/g and a mean pore diameter of 11.8 nm were achieved, evidencing a thin wall of around 0.2 nm. The X-ray diffraction (XRD) results in Figure 2 indicated the formation of a non-stoichiometric $Eu_{(1-x)}O$ compound. Luminescent results showed that the emission and excitation spectra depend on the calcination process. The higher intensities were obtained for the samples calcined at 650 ^{o}C, a result that is attributed to the formation of oxides and to the total elimination of carbonaceous compounds.

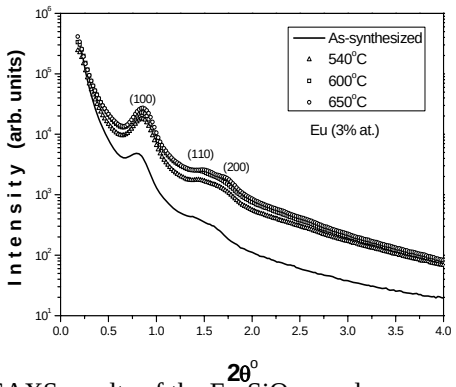

Fig. 1- SAXS results of the Eu:SiO_2 powders.

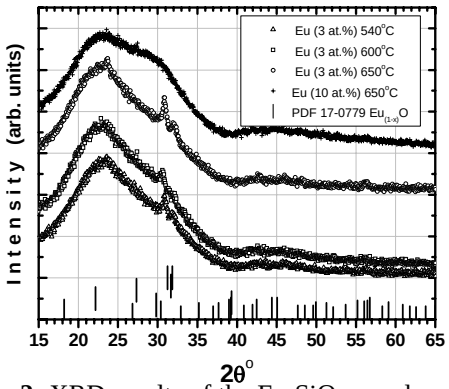

Fig. 2- XRD results of the Eu:SiO_2 powders.

Keywords: ordered mesoporous silica, luminescent, SAXS and XRD.

Work supported by Cristália Indústria Farmacêutica, CNPq and FAPESP.

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