ABSORPTION AND EMISSION SPECTRA OF WATER-SOLUBLE PORPHYRINS IN SOLUTIONS AND SOL-GEL SILICA MATRIX

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The possibility of mixing organic and inorganic compounds in a new unique hybrid material, realised by sol-gel method, is the example of promising and potentially useful chemical technique. The entrapment of organic reagents into sol-gel matrices and coatings has been the object of research since Avnir and co-workers pointed out the role of such systems for sensing purpose. Particularly, the spectroscopic, magnetic and luminescence properties of porphyrins and related compounds, and what is the most important, the ability of porphyrins to photoconduction and photoemission are the grounds of different applications. Sol-gel monoliths and sol-gel thin films are very useful for encapsulation of various guests such as inorganic clusters, lanthanide complexes, laser dyes and bioactive molecules. The sol-gel immobilisation of porphyrins in suitable matrices can be applied in many processes, such as: chemical and biochemical sensing optical limiting, hole-burning and catalysis.

We present here our study on the encapsulation of two water-soluble cationic porphyrins: tetrakis[4-(trimethylammonio)phenyl] (H₂TTMePP) and tetrakis (1-methyl-4-pyridyl) (H₂TMePyP) and their Cu(II) and Eu(III) complexes in the monolith gels and solid thin films obtained by sol-gel method. The samples with different concentrations of the porphyrins were prepared by tetraethoxysilane (TEOS) hydrolysis. We investigated their absorption and emission spectroscopic properties in comparison with the spectra of the same compounds in various solvents. Porphyrins are known to dimerize and to further agglomerate. Uv-vis absorption spectra were used to study the initial step of porphyrin agglomeration in various media. This could be seen by the deviation from the linearity of the Beer-Lambert law. The similar dependence could be observed for the aerogel and the solid thin films.