

PRODUCTION AND CHARACTERIZATION OF NANOSTRUCTURED BIOSENSORS

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Sol-gel derived materials [1] have attracted great research interest in recent times. Their high porosity and good optical transparency has enabled the incorporation of light addressable entities, such as fluorescent probes. Moreover, the incorporation of biologically important molecules has developed into an active field of investigation [2]. Incorporation of the biomolecules associated with a fluorescent dye allows in situ studies on the conformation and molecular dynamics of the entrapped biomolecules and biomolecule–host interactions. These are important factors to be examined in the production of biosensors.

The present work describes novel techniques of silica matrix modification to provide amenable conditions to protein incorporation. Activity measurements confirmed the capability of the modification techniques in preserving the activity of the proteins tested in the present study. The fluorescent dyes *DASPMI* and *Nile red* were successfully used to study the viscosity and polarity of local environments present within sol-gel derived media [3], thus helping to elucidate conformation and molecular dynamics of the protein and its interaction with the host matrix. The results show that this methodology proved very adept, in that it was possible to discriminate the impact of conformation changes on the activity of proteins from the accessibility of reactants constrained by the host morphology.

1. Hench, L.L. and West, J.K., The sol-gel process. *Chem. Rev.*, 1992, 90, 33-72.
2. Livage, J., Coradin, T. and Roux, C., Encapsulation of biomolecules in silica gels. *J. Phys.:Condens. Matter*, 2001, 13, R673-R691.
3. Viseu, T.M.R., Hungerford, G., Coelho A.F. and Ferreira, M.I.C., Dye-host interactions for local effects recognition in homogeneous and nanostructured media. *J. Phys. Chem. B*. 2003, 107, 13300-13312.