SYNTHESIS AND CHARACTERIZATION OF TWO SILICON MATERIALS WITH YEAST CONFINED OBTAINED BY THE SOL-GEL AND THEIR EVALUATION EFFECT OF THE YEAST ENTRAPMENT

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Sol-gel methodology has been extensively used for the preparation of silicon materials for different purposes. Some of them are focused in the preparation of the hybrid materials where organic residues are grafted to silicon matrices or used as templates by molecular imprinting. However, no reports are associated to obtain hybrid materials for the entrapment of cells since the imprinting of higher size structures seems to be more challenging. Thus, our motivation is oriented on developing the strategies by Sol-gel for cell entrapment of Saccharomyces cerevisiae (yeast) on silica gel as well as evaluating the entrapment effect by their biocatalysts performance. Two methods for cell confinement were employed: 1) Using only Tetraethyl orthosilicate alkoxide (TEOS) for the silica gel homopolymer formation and 2) by means of TEOS and 3-aminopropyltriethoxysilane (APTES) as a copolymer. In this work we report the influence of acid hydrolysis of TEOS and APTES as well as the acid medium promotes the covering the yeast by polymerization. The characterization by means of FTIR-ATR spectroscopy showed vibration bands with patterns concerning to inorganic and organic functional groups. Solid state $^{13}$C-Nuclear Magnetic Resonance (ss$^{13}$C-NMR) was used for chemical characterization of the organic biomolecules S. cerevisiae, while for $^{29}$Si was performed to elucidate the inorganic silicon structure by Q$^3$ and Q$^4$ species. X-ray powder diffraction (XRD) showed amorphous patterns in both silica gel materials with cell confined. The micrographs of scanning electron microscopy (SEM) showed the different sizes of the particles of the synthesized material (15 to 25 ?m). The surface area analysis (BET) showed that the entrapment of S. cerevisiae contributes to increase the porosity of the material resulting materials in the mesoporous range.

Keywords: Silica materials, sol-gel, yeast entrapment

Acknowledgment:

Scholarship CONACYT 788375/611730

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