Tentative Outline

Special Issue for Current Organic Chemistry

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TITLE: Organic Polymeric Matrices For The Three-Dimensional Immobilization Of Proteins: A Biochemical And Biophysical Perspective

Aims & Scope:

In the last two decades, the immobilization of proteins in three-dimensional polymeric matrices has proved a powerful tool both for biophysical studies and for the development of bioreactors, biosensors and biodevices. The aqueous microenvironment around individual encapsulated protein molecules commonly allows for the full retention of their biological properties and the preparation-dependent porosity of nano- and meso-porous materials allows for the free accessibility of the protein binding/active sites to small reagents, ligands and substrates. Physical confinement allows for protein recovery and reuse, and easy separation from reaction products. Moreover, immobilization usually enhances protein thermal, chemical and mechanical stability with respect to solution, due to enhanced microviscosity and steric restraints to the large conformational changes associated to protein denaturation. Besides the obvious biotechnological applications, the immobilization of enzymes and other proteins in three-dimensional matrices has allowed a wealth of biophysical studies, enhancing the understanding of their structural and functional properties. As a matter of fact, immobilization allows: i) to isolate molecular species that are metastable or poorly populated in solution, making them accessible to spectroscopy and microscopy studies; ii) to tune, depending on the encapsulation protocol, the distribution of protein conformations and sub-states; iii) to mimic, in vitro, biologically relevant microviscosity and confinement effects on macromolecules conformational equilibria and dynamics. The array of materials used for these applications has greatly increased over the years and now encompasses silicates, organically modified silanes (Ormosils), polylactate, chitosan, alginates and several others. The aim of this issue is to give a perspective on some of the materials most commonly used for three-dimensional protein immobilization, their specificities and their current or perspective applications.

Key words: Protein immobilization, protein function, enzymes, polymeric matrices, ormosils, polylactate, alginate

Subtopics:

- Immobilization of proteins in silica gel: functional properties and applications
- Immobilization of proteins in biopolymer-silica hybrid materials: functional properties and applications
- Immobilization of proteins in ormosil gels: functional properties and applications
- Immobilization of proteins in alginate: functional properties and applications
- Immobilization of proteins in calcium alginate: application in biocatalysis

- Immobilization of proteins in polysaccharide matrices: biochemical and biophysical properties
- Immobilization of proteins in poly-styrene-divinylbenzene: functional properties and applications
- Immobilization of proteins in glyoxyl activated supports: functional properties and applications

Approximate Schedule:

- Manuscript Submission Deadline: 09/30/14
- Peer Review Due: 10/31/14
- Revision Due: 11/30/14
- Notification of Acceptance by the Guest Editor: 12/31/14
- Final Manuscript Due: 01/31/15