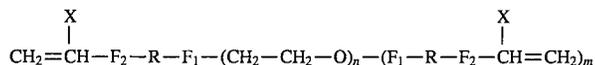


- Karel, S. F., et al. (1985) Chem. and Engg. Science, 40(8):1321.
- Karu, T. I. (1990) Photochem. and Photobiology, 52(6) 1089.
- Kimura, A. et al. (1981), "Some properties of immobilized glycolysis system of yeast in fermentative phosphorylation of nucleotides," Eur. J. Appl. Microbio. Biotechnol., 11:78-80.
- Knowles, P. R., et al. (1990) Makromol. Chem., Macromol. Symp., 40:203-208.
- Lambert, F. V., et al. (1984) Appl. Biochem. Biotech, 10:101-105.
- McMahon, J., et al. (1990) J. Nat. Cancer Inst., 82(22) 1761-1765.
- Miyama, H., et al. (1988) J. Appl. Polym. Sci., 35:115-125.
- Nagoaka, S., et al. Polymers as Biomaterials, Shalaby, S. W. ed., Plenum Press, New York.
- Neckers D.C., et al. (1989) Polym. Materials Sci. Eng., 60:15.
- Okata, T. et al., (1987), "Application of entrapped growing yeast cells to peptide secretion system," Appl. Microbiol. Biotechnol., 26:112-116.
- Omata, T., et al. (1979) "Immobilization of Microbial Cells and Enzymes with Hydrophobic Photo-Crosslinkable Resin Prepolymers" European J. Appl. Microbiol. Biotechnol., 6:207-215.

- a water soluble polymer having at least two sites of unsaturation;
- b) forming small geometric shapes of the mix in (a); and
- c) polymerizing the macromer by exposing the geometric shapes to light radiation.
2. The method of claim 1 wherein the biological material is first encapsulated in a microcapsule.
3. The method of claim 1 wherein the macromer is selected from the group consisting of ethylenically unsaturated derivatives of poly(ethylene oxide) (PEO), poly(ethylene glycol) (PEG), poly(vinyl alcohol) (PVA), poly(vinylpyrrolidone) (PVP), poly(ethyloxazoline) (PEOX), poly(amino acids), polysaccharides, and proteins.
4. The method of claim 3 wherein the PEG is PEG multiacrylate.
5. The method of claim 4 wherein the PEG is PEG tetraacrylate which has a molecular weight around 18,500 D.
6. The method of claim 3 wherein the polysaccharides are selected from the group consisting of alginate, hyaluronic acid, chondroitin sulfate, dextran, dextran sulfate, heparin, heparin sulfate, heparan sulfate, chitosan, gellan gum, xanthan gum, guar gum, water soluble cellulose derivatives and carrageenan.
7. The method of claim 3 wherein the proteins are selected from the group consisting of gelatin, collagen and albumin.
8. The method of claim 1 wherein the macromer is of the formula



- Omata, T., et al. (1979) "Transformation of Steroids by Gel-Entrapped *Nocardia rhodocrous* Cells in Organic Solvent" Eur. J. Appl. Microbiol. Biotechnol. 8:143-155.
- Omata, T. et al. (1981), "Steroselective hydrolysis of dimethyl succinate by gel-entrapped *Rhodotorula minuta* uvr. texensis cells in organic solvent," Eur. J. Appl. Microbiol. Biotechnol., 11:199-204.
- O'Shea, G. M. et al. (1986) Diabetes, 35:943-946.
- Park, T. G. et al. (1989) Biotechnology Letters, 11(1):17, For general references see c) Immobilized cells: Principles & applications, J. Tampion and M. O. Tampion. Cambridge Univ. Press, (1987).
- Rempp, P., et al. (1990) Polym. Prepr. (Am. Chem. Soc., Div. Polym. Chem.), 31:215.
- Reuveny, S., et al. (1983) Biotechnol. Bioeng., 25:469-480.
- Ronel, S. H. et al. U.S. Pat. No. 4,298,002, issued Nov. 3, 1981.
- Sawhney, A. S. et al. "Biocompatible Microcapsules", U.S. patent application.
- Seton, M. V. et al. (1987) J. Controlled Release, 6:177-187.
- Sun, Y., et al. (1987) Polymer Prepr., 28:292-294.
- Tanaka, A. et al., (1977), "Immobilization of Yeast Microbodies by Inclusion with Photo-cross linkable Resins" Eur J Biochem, 80: 193-197.
- van Wachem, P. B., et al. (1987) Biomaterials, 8:323-328.
- Wong et al. (1988) Biomat. Art. Cells, Art. Org., 16 (4) 731.
- Wu, D. S. (November 1990) Laser Focus World, 99-106.

We claim:

1. A method for encapsulation of biological material comprising the steps of
- a) mixing the biological material in an aqueous macromer solution comprising macromer and photoinitiator, said biological material selected from the group consisting of tissue, cells, subcellular organelles and subcellular non-organelle components, said macromer comprising

where

- F₁=CONH, COO or NHCOO
- X=H, CH₃, C₂H₅, C₆H₅, Cl, Br, OH or CH₂COOH
- F₂=COO, CONH, O or C₆H₄,
- R=CH₂ or -alkyl-,
- n≥5, and
- m≥2.

9. The method of claim 1 wherein the photoinitiator is any dye which absorbs light having frequency between 320 nm and 900 nm, can form free radicals, is at least partially water soluble, and is non-toxic to the biological material at the concentration used for polymerization.

10. The method of claim 9 wherein the photoinitiator is selected from the group consisting of 2,2-dimethoxy,2-phenylacetophenone and 2-methoxy, 2-phenylacetophenone.

11. The method of claim 1 wherein the macromer solution further comprises a cocatalyst and the photoinitiator is selected from the group consisting of ethyl eosin, eosin Y, fluorescein, 2,2-dimethoxy,2-phenylacetophenone,2-methoxy,2-phenylacetophenone, camphorquinone, rose bengal, methylene blue, erythrosin, phloxime, thionine, riboflavin and methylene green.

12. The method of claim 11 wherein the cocatalyst is a nitrogen based compound capable of stimulating a free radical reaction.

13. The method of claim 11 wherein the cocatalyst is a nitrogen atom-containing electron-rich molecule.

14. The method of claim 11 wherein the cocatalyst is a primary, secondary, tertiary or quaternary amine.

15. The method of claim 14 wherein the cocatalyst is selected from the group consisting of triethanolamine, triethylamine, ethanolamine, N-methyl diethanolamine, N,N-dimethyl benzylamine, dibenzyl amine, N-benzyl ethanolamine, N-isopropyl benzylamine, tetramethyl