United States Patent [19]

Rha et al.

[11] **Patent Number: 4,744,933**

[45] **Date of Patent: May 17, 1988**

[54] **PROCESS FOR ENCAPSULATION AND ENCAPSULATED ACTIVE MATERIAL SYSTEM**

[75] Inventors: **ChoKyun Rha**, Boston; **Dolores Rodriguez-Sanchez**, Cambridge, both of Mass.

[73] Assignee: **Massachusetts Institute of Technology**, Cambridge, Mass.

[21] Appl. No.: **766,214**

[22] Filed: **Aug. 16, 1985**

Related U.S. Application Data

[63] Continuation of Ser. No. 580,394, Feb. 15, 1984, abandoned.

[51] **Int. Cl.**[4] **A61K 9/62;** A61K 9/64; A61K 37/00; B01J 13/02

[52] **U.S. Cl.** **264/4.3;** 264/4.1; 424/93; 424/455; 424/460; 424/461; 428/402.2; 514/963

[58] **Field of Search** 264/4.1, 4.3; 428/402.2; 424/33, 455, 460, 461

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,800,457	7/1957	Green et al.	428/402.2
3,415,758	12/1968	Powell et al.	428/404.2 X
3,549,555	12/1970	Hiestand et al.	264/4.3 X
3,629,392	12/1971	Banker et al.	424/33 X
3,959,457	5/1976	Speaker et al.	424/35 X
3,994,827	11/1976	Sakai et al.	264/4.1 X
4,001,480	1/1977	Shank	264/4.1 X
4,389,330	6/1983	Tice et al.	264/4.1 X
4,391,909	7/1983	Lim	424/34 X
4,407,957	10/1983	Lim	264/4.3 X

Primary Examiner—Richard D. Lovering
Attorney, Agent, or Firm—Paul J. Cook

[57] **ABSTRACT**

Capsules are formed herein a liquified core while avoiding capsule core gelation by adding drops of a solution of either an anionic polymer composition or a cationic polymer composition to a solution of an ionic polymer of opposite charge. The drops contain an active ingredient such as a cell or microorganism capable of producing a biologically active product or can contain a biological or chemical composition. The interface of the ionic polymers form a permeable membrane surrounding the liquid drops.

14 Claims, No Drawings