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(12) **United States Patent**  
**Kuhrts**

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(54) **SUSTAINED-RELEASE  
MICROENCAPSULATED DELIVERY  
SYSTEM**

5,849,240 A \* 12/1998 Miller et al. .... 264/460  
5,958,452 A \* 9/1999 Oshlack et al. .... 424/457  
6,048,562 A \* 4/2000 Mandralis et al. .... 426/573

(75) Inventor: **Eric H. Kuhrts**, Bodega, CA (US)

\* cited by examiner

(73) Assignee: **Lipoprotein Technologies, Inc.**,  
Bodega, CA (US)

*Primary Examiner*—Thurman K. Page  
*Assistant Examiner*—S. Tran

(\* ) Notice: Subject to any disclaimer, the term of this  
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(74) *Attorney, Agent, or Firm*—Thorpe North & Western,  
LLP

(57) **ABSTRACT**

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Disclosed is a process for producing sustained-release powders that is fast, efficient, and economical. The process involves melting an animal or vegetable oil with a melting point above 110 degrees F. in specially designed mixer through either the work energy input of the mixer shaft itself, or a specially fitted plow type mixer equipped with a heating tank, cooling unit, jacket for hot water circulation, and heated lines with nozzles for atomizing the hot oil to be sprayed on. The entire manufacturing process can be completed in about 5–30 minutes, and results in small, sustained-release particles that are free flowing and solid at room temperature. The preferred oil is a hydrogenated soy oil with a melting point range of 145–160 degrees F. which is applied at about a 5% level by weight in a high shear mixer. Also included are sustained-release compositions for therapeutic agents such as drugs, botanicals, biological agents, fungicides, and fertilizers.

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424/491; 424/498

(58) **Field of Search** ..... 424/489, 499,  
424/502

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,837,381 A \* 6/1989 Steber et al. .... 424/500  
5,494,681 A \* 2/1996 Cuca et al. .... 424/484  
5,756,719 A \* 5/1998 Chaundy et al. .... 536/119

**50 Claims, No Drawings**