



US005589105A

United States Patent [19]

[11] Patent Number: **5,589,105**

DeSimone et al.

[45] Date of Patent: **Dec. 31, 1996**

[54] **HETEROGENEOUS POLYMERIZATION IN CARBON DIOXIDE**

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[21] Appl. No.: **443,478**

[22] Filed: **May 18, 1995**

Related U.S. Application Data

[62] Division of Ser. No. 378,550, Jan. 25, 1995, Pat. No. 5,506,317, which is a division of Ser. No. 299,516, Sep. 1, 1994, Pat. No. 5,451,633, which is a division of Ser. No. 99,905, Jul. 30, 1993, Pat. No. 5,312,882.

[51] **Int. Cl.⁶** **B01F 17/00; B01F 1/00**

[52] **U.S. Cl.** **252/351; 252/364**

[58] **Field of Search** **252/364, 351**

References Cited

U.S. PATENT DOCUMENTS

3,191,513 6/1965 Turner 95/39

3,375,767	4/1968	Hanlon	.....	95/39
3,522,228	7/1970	Fukui et al.	.	
3,817,871	6/1974	Graff	.....	252/364
4,243,548	1/1981	Heeb et al.	.....	252/364
4,748,220	5/1988	Hartmann et al.	.	
4,933,404	6/1990	Beckmann et al.	.	
5,045,220	9/1991	Harris et al.	.....	252/364

FOREIGN PATENT DOCUMENTS

0301532	2/1989	European Pat. Off.	.	
57-149367	9/1982	Japan	.....	252/364
330438	6/1930	United Kingdom	.	
WO93/04160	3/1993	WIPO	.....	252/364

OTHER PUBLICATIONS

DeSimone et al.; *Synthesis of Fluoropolymers in Supercritical Carbon Dioxide*; Science 257; 945-947; (1992).

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[57] ABSTRACT

The heterogeneous polymerization of water-insoluble polymer in CO₂ is disclosed. The method comprises providing a heterogeneous reaction mixture comprising CO₂, a monomer, and a surfactant, then polymerizing the monomer to form a water-insoluble polymer.

22 Claims, 2 Drawing Sheets