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(54) **CO<sub>2</sub>-ASSISTED DEPLOYMERIZATION, PURIFICATION AND RECYCLING OF STEP-GROWTH POLYMERS**

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(52) **U.S. Cl.** ..... **521/40; 521/48; 521/48.5; 521/49; 521/49.5**

(58) **Field of Search** ..... **521/40, 48, 48.5, 521/49, 49.8**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

3,321,510 A 5/1967 Lotz et al.

3,403,115 A	9/1968	Gruschke et al.	
5,049,647 A *	9/1991	Al-Ghatta .....	528/272
5,055,167 A *	10/1991	Dummersdorf et al. ....	204/165
5,413,681 A *	5/1995	Tustin et al. ....	203/80
5,432,203 A	7/1995	DeBruin et al.	
2004/0054238 A1 *	3/2004	Ban et al. ....	568/723

**FOREIGN PATENT DOCUMENTS**

CA	2 219 217 A1	4/1998
EP	0 484 963 B1	7/1995
EP	0 662 466 B1	3/1997
GB	2 041 916 A	9/1980

**OTHER PUBLICATIONS**

Paszun et al., *Chemical Recycling of Poly(ethylene terephthalate)*, Ind. Eng. Chem. Res., 1997, 36, pp. 1373-1383.

\* cited by examiner

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(57) **ABSTRACT**

A method of depolymerizing a polymer comprises contacting a polymer with a fluid comprising carbon dioxide and at least one component, wherein the fluid plasticizes the polymer and facilitates penetration of the component into the polymer to depolymerize the polymer and form oligomeric units, monomeric units, or combinations thereof.

**38 Claims, 2 Drawing Sheets**

