



US012049589B2

(12) **United States Patent**
Asirvatham

(10) **Patent No.:** **US 12,049,589 B2**

(45) **Date of Patent:** **Jul. 30, 2024**

(54) **SURFACTANTS FOR OIL AND GAS PRODUCTION**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/225,004**

(22) Filed: **Jul. 21, 2023**

(65) **Prior Publication Data**

US 2023/0357626 A1 Nov. 9, 2023

Related U.S. Application Data

(62) Division of application No. 17/979,637, filed on Nov.
2, 2022, now Pat. No. 11,891,568, which is a division
of application No. 17/127,033, filed on Dec. 18, 2020,
now Pat. No. 11,542,428.

(60) Provisional application No. 62/955,873, filed on Dec.
31, 2019.

(51) **Int. Cl.**

C09K 8/584 (2006.01)

C07F 7/08 (2006.01)

C09K 8/588 (2006.01)

C09K 8/594 (2006.01)

E21B 43/16 (2006.01)

(52) **U.S. Cl.**

CPC **C09K 8/584** (2013.01); **C07F 7/0838**
(2013.01); **C09K 8/588** (2013.01); **C09K 8/594**
(2013.01); **E21B 43/16** (2013.01)

(58) **Field of Classification Search**

CPC C09K 8/584

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,515,214 A	6/1970	Finch
3,624,120 A	11/1971	Yetter
3,929,678 A	12/1975	Laughlin et al.
4,933,002 A	6/1990	Petroff et al.
5,041,590 A	8/1991	Snow
5,162,155 A	11/1992	Berndt et al.
5,707,550 A	1/1998	Glover et al.
5,972,323 A	10/1999	Lang et al.

(Continued)

FOREIGN PATENT DOCUMENTS

CN	1942531 A	4/2007
CN	101356201 A	1/2009

(Continued)

OTHER PUBLICATIONS

Amino Acid—Britannica Online Encyclopedia (Jul. 17, 2009) (Year:
2009).

(Continued)

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(57) **ABSTRACT**

Surfactants for use in formulations and processes suitable
for hydrocarbon recovery. These formulations, include for-
mulations suitable for fracking, enhancing oil and or gas
recovery, and the recovery and or production of bio-based
oils.

12 Claims, 7 Drawing Sheets

