



US012351547B2

(12) **United States Patent**
Asirvatham et al.

(10) **Patent No.:** **US 12,351,547 B2**
(45) **Date of Patent:** ***Jul. 8, 2025**

(54) **BRANCHED AMINO ACID SURFACTANTS**

(71) Applicant: **AdvanSix Resins & Chemicals LLC**,
Parsippany, NJ (US)

(72) Inventors: **Edward Asirvatham**, Chatham, NJ
(US); **Andrei Honciuc**, Iasi (RO);
Voichita Mihali, Basel (CH)

(73) Assignee: **ADVANSIX RESINS &**
CHEMICALS LLC, Parsippany, NJ
(US)

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

This patent is subject to a terminal dis-
claimer.

(21) Appl. No.: **18/404,325**

(22) Filed: **Jan. 4, 2024**

(65) **Prior Publication Data**

US 2024/0174602 A1 May 30, 2024

Related U.S. Application Data

(62) Division of application No. 17/365,770, filed on Jul.
1, 2021, now Pat. No. 11,897,834.

(60) Provisional application No. 63/049,726, filed on Jul.
9, 2020.

(51) **Int. Cl.**
C07C 309/22 (2006.01)
C07C 229/08 (2006.01)
C07C 229/12 (2006.01)
C09K 23/00 (2022.01)

(52) **U.S. Cl.**
CPC **C07C 309/22** (2013.01); **C07C 229/08**
(2013.01); **C07C 229/12** (2013.01); **C09K**
23/00 (2022.01)

(58) **Field of Classification Search**
CPC ... C07C 309/22; C07C 229/08; C07C 229/12;
C11D 1/46
USPC 562/105
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,194,052 A 3/1980 Lewis et al.
4,550,137 A 10/1985 Dowbenko et al.
5,851,982 A 12/1998 Sakata et al.
6,372,703 B1 4/2002 Richter et al.
9,481,695 B2 11/2016 Knott et al.
10,227,548 B2 3/2019 Zhang et al.
2003/0060390 A1 3/2003 Demeyere et al.
2007/0167347 A1 7/2007 Gallotti et al.
2007/0179080 A1 8/2007 Gallotti et al.
2008/0280865 A1 11/2008 Tobita
2014/0246041 A1 9/2014 Krueger
2015/0141315 A1 5/2015 Jin
2016/0340610 A1 11/2016 Zhang et al.
2017/0081277 A1 3/2017 Boaz et al.

2017/0137750 A1 5/2017 Zhang et al.
2017/0342346 A1 11/2017 Zhang et al.
2017/0349859 A1 12/2017 Zhang et al.
2018/0002639 A1 1/2018 Zhang et al.
2018/0371366 A1 12/2018 Zhang et al.
2019/0300822 A1 10/2019 Zhang et al.
2022/0009881 A1 1/2022 Asirvatham et al.
2022/0102460 A1 3/2022 Xu et al.

FOREIGN PATENT DOCUMENTS

CA 2006439 A1 7/1990
CN 109154029 A 1/2019
DE 10021538 B4 6/2008
DE 102015223826 A1 9/2016
EP 0385562 A2 9/1990
EP 0883600 B1 10/2001
EP 1584674 A1 10/2005
EP 3158042 B1 12/2018
GB 2310659 A 9/1997
JP 01-190798 A 7/1989
JP 08-092875 A 4/1996
JP 08-231478 A 9/1996
JP 08-232168 A 9/1996
JP 09-105076 A 4/1997
JP 2001-048851 A 2/2001
JP 3425227 B2 7/2003
JP 3502679 B2 3/2004
JP 3502680 B2 3/2004
JP 3563473 B2 9/2004
JP 2005-054327 A 3/2005
JP 4156467 B2 9/2008

(Continued)

OTHER PUBLICATIONS

Anonymous, "Biocidal Compositions containing 4,4'-dichloro-2-
hydroxydiphenylether (DCPP)," IP.com No. IPCOM000213522D,
Dec. 20, 2011, pp. 1-36.

International Preliminary Report on Patentability received for PCT
Patent Application No. PCT/US2021/040162, mailed on Jan. 19,
2023, 8 pages.

International Search Report and Written Opinion received for PCT
Patent Application No. PCT/US2021/040162, mailed on Oct. 18,
2021, 13 pages.

Machine translation JP 08231478, year 1996.

Primary Examiner — Ana Z Muresan

(74) *Attorney, Agent, or Firm* — Faegre Drinker Biddle &
Reath LLP

(57) **ABSTRACT**

The present disclosure provides derivatives of amino acids
that have branched alkyl structures and surface-active prop-
erties. The amino acid can be naturally-occurring or syn-
thetic, or they may be obtained via a ring-opening reaction
of a lactam, such as caprolactam. The amino acid may be
functionalized to form a compound that is surface-active and
have advantageous surfactant characteristics. The com-
pounds of the present disclosure have low critical micelle
concentrations (CMC) as well as superior ability to lower
the surface tension of a liquid.

4 Claims, 10 Drawing Sheets