



US010717042B2

(12) **United States Patent**
Laporte et al.(10) **Patent No.:** **US 10,717,042 B2**(45) **Date of Patent:** **Jul. 21, 2020**(54) **METHOD FOR NO_x UPTAKE USING A PARTICULATE EARTH ALKALI CARBONATE-COMPRISING MATERIAL AND/OR PARTICULATE EARTH ALKALI PHOSPHATE-COMPRISING MATERIAL**(71) Applicant: **Omya International AG**, Oftringen (CH)(72) Inventors: **Christophe Laporte**, Romont (CH); **Daniel Frey**, Zofingen (CH); **Kai Max Hettmann**, Grenzach-Wyhlen (DE); **Samuel Rentsch**, Spiegel bei Bern (CH); **Detlef Gysau**, Full (CH); **Patrick A. C. Gane**, Rothrist (CH)(73) Assignee: **Omya International AG**, Oftringen (CH)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 32 days.

(21) Appl. No.: **16/071,389**(22) PCT Filed: **Mar. 6, 2017**(86) PCT No.: **PCT/EP2017/055178**

§ 371 (c)(1),

(2) Date: **Jul. 19, 2018**(87) PCT Pub. No.: **WO2017/153329**PCT Pub. Date: **Sep. 14, 2017**(65) **Prior Publication Data**

US 2020/0016531 A1 Jan. 16, 2020

Related U.S. Application Data

(60) Provisional application No. 62/307,603, filed on Mar. 14, 2016.

(51) **Int. Cl.****B01D 53/56** (2006.01)**B01J 20/04** (2006.01)**B01J 20/28** (2006.01)**B01J 20/30** (2006.01)**C02F 1/28** (2006.01)**C02F 101/16** (2006.01)(52) **U.S. Cl.**CPC **B01D 53/565** (2013.01); **B01J 20/043** (2013.01); **B01J 20/048** (2013.01); **B01J 20/28059** (2013.01); **B01J 20/28061** (2013.01); **B01J 20/3071** (2013.01); **C02F 1/281** (2013.01); **B01D 2251/404** (2013.01); **B01D 2251/604** (2013.01); **B01D 2251/606** (2013.01); **B01D 2251/61** (2013.01); **B01D 2253/306** (2013.01); **B01D 2257/402** (2013.01); **B01D 2257/404** (2013.01); **C02F 2101/163** (2013.01); **C02F 2101/166** (2013.01)(58) **Field of Classification Search**

CPC .. B01D 53/56; B01D 53/565; B01D 53/9409; B01D 53/9413; B01D 2251/606; B01D 2251/61; B01D 2257/402; B01D 2257/404; B01J 20/043; B01J 20/048; B01J 2208/00805

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,754,074 A * 8/1973 Grantham B01D 53/34 423/210.5
3,880,618 A * 4/1975 McCrea B01D 53/04 95/114
4,859,438 A * 8/1989 Lindbauer B01D 53/34 423/239.1
4,921,886 A * 5/1990 Ewan B01D 53/508 423/235
4,996,036 A * 2/1991 Fisher B01D 53/56 423/235
5,348,716 A * 9/1994 De Soete B01D 53/56 423/239.1
5,489,420 A * 2/1996 Diep B01D 53/56 423/235
5,846,286 A * 12/1998 Tseng B01D 53/56 71/58
6,136,186 A 10/2000 Gonzalez-Martin et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CN 101721908 6/2010
CN 101626830 10/2012
EP 1 559 753 A2 8/2005
EP 1 645 322 A1 4/2006
EP 2 264 108 A1 12/2010
EP 2 264 109 A1 12/2010
EP 1982759 9/2011
JP H07-196314 A 8/1995
JP H07-223813 A 8/1995
JP H11-290694 A 10/1999
JP 3-113903 B2 12/2000
JP 2001-232206 A 8/2001
JP 2003-063852 A 3/2003

(Continued)

OTHER PUBLICATIONS

The International Search Report dated Oct. 5, 2017 from PCT/EP2017/055178.

(Continued)

Primary Examiner — Timothy C Vanoy(74) *Attorney, Agent, or Firm* — Heslin Rothenberg Farley & Mesiti, P.C.(57) **ABSTRACT**

The present invention relates to a process for taking up one or more nitrogen oxide(s) from a gaseous and/or aerosol or liquid medium using at least one particulate earth alkali carbonate-comprising material and/or at least one particulate earth alkali phosphate-comprising material as well as an adsorbing material comprising said at least one particulate earth alkali carbonate-comprising material and/or at least one particulate earth alkali phosphate-comprising material.

20 Claims, 1 Drawing Sheet