US009410463B2

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

(10) **Patent No.: US 9,410,463 B2**
(45) **Date of Patent: *Aug. 9, 2016**

(54) **COMPOSITE PARTICLES, HONEYCOMB STRUCTURE, METHOD FOR MANUFACTURING HONEYCOMB STRUCTURE, AND EXHAUST GAS PURIFYING APPARATUS**

(75) Inventors: **Yoshitoyo Nishio**, Gifu (JP); **Takunari Murakami**, Gifu (JP)

(73) Assignee: **IBIDEN CO., LTD.**, Gifu (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 318 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **14/128,556**

(22) PCT Filed: **Aug. 18, 2011**

(86) PCT No.: **PCT/JP2011/068704**

§ 371 (c)(1),
(2), (4) Date: **Dec. 20, 2013**

(87) PCT Pub. No.: **WO2013/024545**

PCT Pub. Date: **Feb. 21, 2013**

(65) **Prior Publication Data**

US 2014/0127087 A1 May 8, 2014

(51) **Int. Cl.**
B01D 50/00 (2006.01)
F01N 3/28 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***F01N 3/2828*** (2013.01); ***B01J 29/85*** (2013.01); ***B01J 35/04*** (2013.01); ***B01J 35/1019*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B01D 43/9418; B01J 2229/186; B01J 35/1019; B01J 29/85; C01B 37/08
USPC 422/177, 180; 502/60, 64, 67, 74
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,733,837 A 3/1998 Nakatsuji et al.
6,414,208 B1 7/2002 Tsutsui et al.
(Continued)

FOREIGN PATENT DOCUMENTS

EP 2269733 A1 1/2011
EP 2425892 A1 3/2012
(Continued)

OTHER PUBLICATIONS

European Extended Search Report, European Application No. 11870883.3, Apr. 29, 2015, 8 pages.
(Continued)

Primary Examiner — Tom P Duong
(74) *Attorney, Agent, or Firm* — Fenwick & West LLP

(57) **ABSTRACT**

An object of the invention is to provide composite particles that have excellent NOx purification performance and can suppress water adsorption-caused contraction and water desorption-caused expansion and to provide a honeycomb structure that has excellent NOx purification performance and can suppress the breakage of the honeycomb unit due to the adsorption or desorption of water, a method for manufacturing the honeycomb structure, and an exhaust gas purifying apparatus including the honeycomb structure. The composite particles of the invention are composite particles having a metallic oxide attached to silicoaluminophosphate particles with a ratio of an amount of Si to a sum of amounts of Al and P in a range of 0.16 to 0.33, in which a specific surface area is in a range of 250 m^2/g to 450 m^2/g, and an external surface area is in a range of 30 m^2/g to 90 m^2/g.

16 Claims, 3 Drawing Sheets