

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
20 January 2022 (20.01.2022)



(10) International Publication Number
WO 2022/015882 A1

(51) International Patent Classification:

B01D 53/14 (2006.01) *C25B 1/04* (2021.01)
B01D 53/32 (2006.01) *B01D 53/22* (2006.01)

(21) International Application Number:

PCT/US2021/041677

(22) International Filing Date:

14 July 2021 (14.07.2021)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/051,785 14 July 2020 (14.07.2020) US
63/210,865 15 June 2021 (15.06.2021) US

(71) Applicant: THE BOARD OF TRUSTEES OF THE
UNIVERSITY OF ILLINOIS [US/US]; 352 Henry Ad-

ministration Building, 506 South Wright Street, Urbana, IL
61801 (US).

(72) Inventors: SINGH, Meenesh R.; 929 West Taylor Street,
Engineering Innovation Building, Room 256, Chicago,
IL 60607 (US). PRAJAPATI, Aditya; 929 West Taylor
Street, Engineering Innovation Building, Room 256, Chica-
go, Illinois, IL 60607 (US). SARTAPE, Rohan; 929 West
Taylor Street, Engineering Innovation Building, Room 256,
Chicago, IL 60607 (US).

(74) Agent: BURNETTE, Jennifer; Marshall, Gerstein &
Borun LLP, 233 S. Wacker Drive, 6300 Willis Tower, Chicago,
IL 60606-6357 (US).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

(54) Title: SYSTEMS AND PROCESS FOR CARBON CAPTURE AND CONVERSION

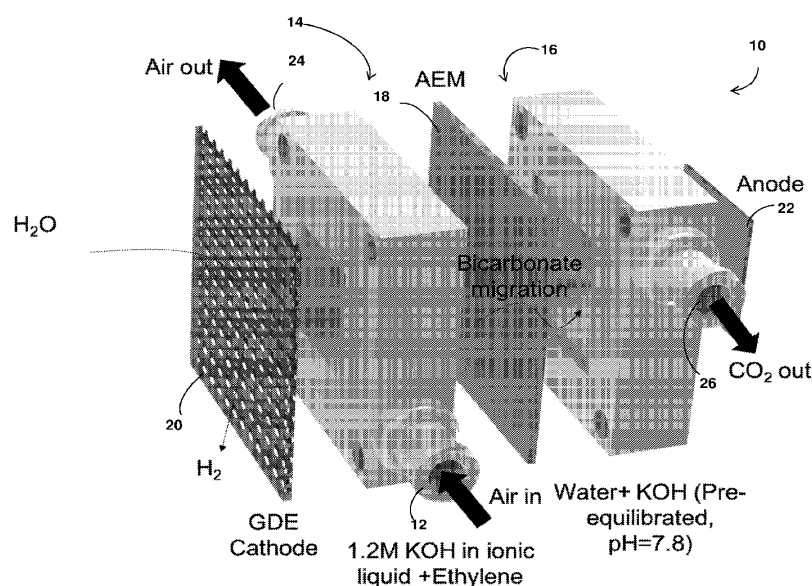


Figure 2

(57) Abstract: An active CO₂ capture unit for capturing CO₂ from a dilute source of CO₂ input gas can include an inlet through which an input gas is introduced into the unit and a non-aqueous region comprising a non-aqueous CO₂ binding organic liquid containing OH⁻ arranged to be in contact with the input gas to chemisorb CO₂ from the input gas and convert the chemisorbed CO₂ into HCO₃⁻ by reacting with OH⁻. The unit also includes an aqueous region arranged downstream of the non-aqueous region, wherein at an aqueous region interface, the HCO₃⁻ interacts with H₂O and decomposes to CO₂ and CO₃²⁻. An anion exchange membrane is disposed between the non-aqueous region and the aqueous region to facilitate HCO₃⁻ diffusion and migration from the non-aqueous region to the aqueous region. A captured CO₂ outlet is disposed downstream of the aqueous region.

[Continued on next page]

WO 2022/015882 A1

HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN,
KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO,
NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW,
SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))