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- (71) **Applicant:** **THE BOARD OF TRUSTEES OF THE UNIVERSITY OF ILLINOIS** [US/US]; 352 Henry Administration Building, 506 South Wright Street, Urbana, Illinois 61801 (US).
- (72) **Inventors:** **SINGH, Meenesh**; 352 Henry Administration Building, 506 South Wright Street, Urbana, Illinois 61801 (US). **PRAJAPATI, Aditya**; 352 Henry Adminis-

tration Building, 506 South Wright Street, Urbana, Illinois 61801 (US). **SARTAPE, Rohan**; 352 Henry Administration Building, 506 South Wright Street, Urbana, Illinois 61801 (US).

- (74) **Agent:** **THOMAS HORSTEMEYER LLP**; Attn.: Ragan BUCKLEY, 3200 Windy Hill Road SE, Suite 1600E, Atlanta, Georgia 30339 (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, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, 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.

- (54) **Title:** INTEGRATED SYSTEM(S) AND METHODS FOR CONTINUOUS ELECTROCHEMICAL CAPTURE AND REDUCTION OF CO₂ FROM DILUTE SOURCES

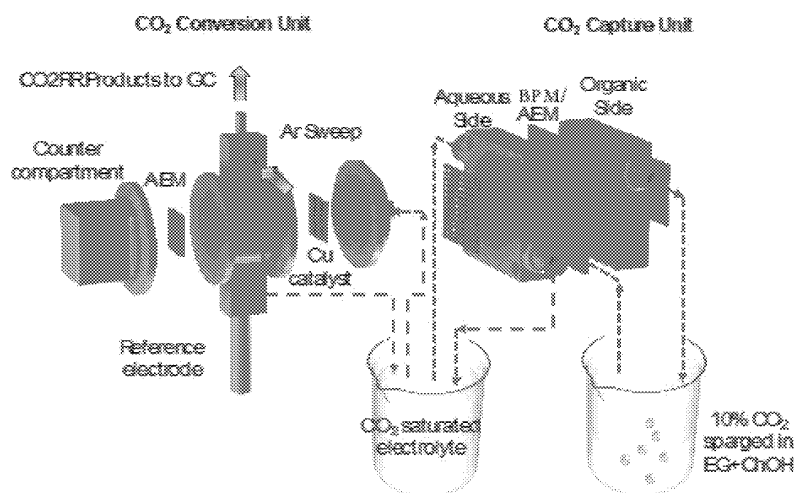


FIG. 1C

- (57) **Abstract:** In one aspect, the disclosure relates to a composition and a catalyst for substantially continuous CO₂ capture and reduction from dilute CO₂ sources including flue gas, wherein the flux of CO₂ captured is substantially equal to the flux of CO₂ reduction. The system can comprise integrated CO₂ capture and reduction components. An exemplary system includes a composition of a catalyst and electrolytes. The catalyst can comprise supported or unsupported mesh electrodes that comprise Cu, a Cu-Al alloy, and/or a copper oxide. In one aspect, the system includes one or more membranes separating an anodic side from a cathodic side in the system, where the one or more membranes can be a bipolar membrane, an anion exchange membrane, or both, which can reduce or eliminate Cl₂ production. In exemplary embodiments, the value-added products can be selected from CO, CH₄, C₂H₄, C₂H₅OH, CH₃COOH, CH₃OH, C₃H₆, and/or H₂.

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- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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