

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
02 November 2023 (02.11.2023)



(10) International Publication Number
WO 2023/211839 A2

(51) International Patent Classification:
Not classified

(21) International Application Number:
PCT/US2023/019625

(22) International Filing Date:
24 April 2023 (24.04.2023)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
17/730,942 27 April 2022 (27.04.2022) US

(71) Applicant: SAUDI ARABIAN OIL COMPANY
[SA/SA]; 1 Eastern Avenue, Dhahran, 31311 (SA).

(71) Applicant (for AG only): ARAMCO SERVICES COM-
PANY [US/US]; 1200 Smith Street, Two Allen Building,
Houston, Texas 77002 (US).

(72) Inventors: PHAM, Thang; Saudi Aramco, P.O. Box 2212,
Dhahran, 31311 (SA). PEREZ, Omar David Hurtado;
Saudi Aramco, P.O. Box 8537, Dhahran, 31311 (SA).
KATIKANENI, Sai P.; Saudi Aramco, P.O. Box 62,
Dhahran, 31311 (SA).

(74) Agent: DEAN, Sean M. et al.; FISH & RICHARDSON
P.C., P.O. Box 1022, Minneapolis, Minnesota 55440-1022
(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.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, CV,
GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, 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, ME, 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:

— without international search report and to be republished
upon receipt of that report (Rule 48.2(g))



WO 2023/211839 A2

(54) Title: CO-PRODUCTION OF HYDROGEN, CARBON, AND ELECTRICITY WITH CARBON DIOXIDE CAPTURE

(57) Abstract: A hydrocarbon feed stream is exposed to heat in an absence of oxygen (pyrolysis) to convert the hydrocarbon feed stream into a solids stream and a gas stream. The solids stream includes carbon. The gas stream includes hydrogen. The gas stream is separated into an exhaust gas stream and a first hydrogen stream. The first hydrogen stream includes at least a portion of the hydrogen from the gas stream. The carbon is separated from the solids stream to produce a carbon stream. Electrolysis is performed on a water stream to produce an oxygen stream and a second hydrogen stream. At least a portion of the oxygen of the oxygen stream and at least a portion of the carbon of the carbon stream are combined to generate power and a carbon dioxide stream. At least a portion of the generated power is used to perform the electrolysis on the water stream.