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(21) International Application Number: PCT/US99/19661 (22) International Filing Date: 1 September 1999 (01.09.99) (30) Priority Data: 09/157,687 21 September 1998 (21.09.98) US (71) Applicant: THE REGENTS OF THE UNIVERSITY OF CALIFORNIA [US/US]; 8th floor, 1111 Franklin Street, Oakland, CA 94607-5200 (US). (72) Inventors: PHAM, Ai-Quoc; 1908 Via Reggio Court, Fremont, CA 95132 (US). WALLMAN, P., Henrik; 1457 Olympus Avenue, Berkeley, CA 94708 (US). GLASS, Robert S.; 1810 Creek Road, Livermore, CA 94550 (US). (74) Agent: GRZYBICKI, Daryl, S.; P.O. Box 808, L-703, Livermore, CA 94551 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: NATURAL GAS-ASSISTED STEAM ELECTROLYZER (57) Abstract An efficient method of producing hydrogen by high temperature steam electrolysis that will lower the electricity consumption to an estimated 65 percent lower than has been achievable with previous steam electrolyzer systems. This is accomplished with a natural gas-assisted steam electrolyzer, which significantly reduces the electricity consumption. Since this natural gas-assisted steam electrolyzer replaces one unit of electrical energy by one unit of energy content in natural gas at one-quarter the cost, the hydrogen production cost will be significantly reduced. Also, it is possible to vary the ratio between the electricity and the natural gas supplied to the system in response to fluctuations in relative prices for these two energy sources. In one approach an appropriate catalyst on the anode side of the electrolyzer will promote the partial oxidation of natural gas to CO and hydrogen, called Syn-Gas, and the CO can also be shifted to CO₂ to give additional hydrogen. In another approach the natural gas is used in the anode side of the electrolyzer to burn out the oxygen resulting from electrolysis, thus reducing or eliminating the potential difference across the electrolyzer membrane.		