



(51) International Patent Classification:

H01L 31/18 (2006.01) *H01L 31/036* (2006.01)
H01L 21/30 (2006.01)

(21) International Application Number:

PCT/AU2013/000528

(22) International Filing Date:

20 May 2013 (20.05.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2012902090 21 May 2012 (21.05.2012) AU

(71) Applicant: **NEWSOUTH INNOVATIONS PTY LIMITED** [AU/AU]; Rupert Myers Building, Level 2, Gate 14, Barker Street, UNSW, Sydney, New South Wales 2052 (AU).(72) Inventors: **WENHAM, Stuart Ross**; 19 Sturt Road, Cronulla, New South Wales 2230 (AU). **HAMER, Phillip George**; 7/41a Anzac Parade, Kensington, New South Wales 2033 (AU). **HALLAM, Brett Jason**; 36A Washington Street, Bexley, New South Wales 2207 (AU). **SUGI-ANTO, Adeline**; 22 Lucas Avenue, Malabar, New South Wales 2036 (AU). **CHAN, Catherine Emily**; 5/47 Gildershorpe Avenue, Randwick, New South Wales 2031 (AU). **SONG, Lihui**; 285 Botany Street, Randwick, New South Wales 2031 (AU). **LU, Pei-Hsuan**; 6/18 Market Street, Rockdale, New South Wales 2122 (AU). **WENHAM, Alison Maree**; 19 Sturt Road, Cronulla, New South Wales 2230 (AU). **MAI, Ly**; 32 Woods Road, Sefton, New South Wales 2162 (AU). **CHONG, Chee Mun**; 1/1-3 Cooper Park Road, Bellevue Hill, New South Wales 2023 (AU).

XU, GuangQi; Unit 15, 6-8 Church Street, Randwick, New South Wales 2031 (AU). **EDWARDS, Matthew Bruce**; 7 Wesley Street, Elanora Heights, New South Wales 2101 (AU).

(74) Agent: **FB RICE**; Level 23, 44 Market Street, Sydney, New South Wales 2000 (AU).

(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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, 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, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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, 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, ML, MR, NE, SN, TD, TG).

Published:

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

(54) Title: ADVANCED HYDROGENATION OF SILICON SOLAR CELLS

(57) **Abstract:** A method of hydrogenation of a silicon photovoltaic junction device is provided, the silicon photovoltaic junction device comprising p-type silicon semiconductor material and n-type silicon semiconductor material forming at least one p-n junction. The method comprises: i) ensuring that any silicon surface phosphorus diffused layers through which hydrogen must diffuse have peak doping concentrations of 1×10^{20} atoms/cm³ or less and silicon surface boron diffused layers through which hydrogen must diffuse have peak doping concentrations of 1×10^{19} atoms/cm³ or less; ii) Providing one or more hydrogen sources accessible by each surface of the device; and iii) Heating the device, or a local region of the device to at least 40°C while simultaneously illuminating at least some and/or advantageously all of the device with at least one light source whereby the cumulative power of all the incident photons with sufficient energy to generate electron hole pairs within the silicon (in other words photons with energy levels above the bandgap of silicon of 1.12eV) is at least 20mW/cm².

