



(11) **EP 2 273 563 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
**05.12.2012 Bulletin 2012/49**

(51) Int Cl.:  
**H01L 31/075**<sup>(2012.01)</sup> **H01L 31/18**<sup>(2006.01)</sup>  
**H01L 31/0368**<sup>(2006.01)</sup> **H01L 31/0376**<sup>(2006.01)</sup>

(43) Date of publication A2:  
**12.01.2011 Bulletin 2011/02**

(21) Application number: **10160268.8**

(22) Date of filing: **19.04.2010**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR**  
Designated Extension States:  
**AL BA ME RS**

(71) Applicant: **KISCO**  
**Gyeongsangnam-do 641-370 (KR)**

(72) Inventor: **Myong, Seung-Yeop**  
**156-831, Seoul (KR)**

(30) Priority: **07.07.2009 KR 20090061681**

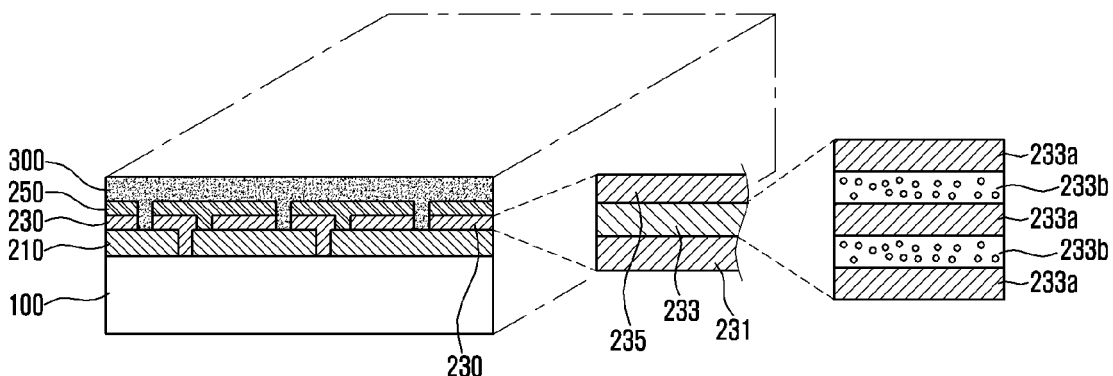
(74) Representative: **Ferreccio, Rinaldo**  
**Botti & Ferrari S.r.l.**  
**Via Cappellini, 11**  
**20124 Milano (IT)**

(54) **Photovoltaic device and manufacturing method thereof**

(57) Disclosed is a photovoltaic device. The photovoltaic device includes:  
a substrate (100);  
a first electrode (210) disposed on the substrate;  
at least one photoelectric transformation layer (230) disposed on the first electrode, the photoelectric transformation layer including a light absorbing layer (233); and  
a second electrode (250) disposed on the photoelectric transformation layer,

wherein the light absorbing layer includes the first sub-layer (233a) and the second sub-layer (233b), the first sub-layer (233a) including hydrogenated micro-crystalline silicon germanium ( $\mu\text{c-SiGe:H}$ ) and an amorphous silicon germanium network ( $\text{a-SiGe:H}$ ) formed among the hydrogenated micro-crystalline silicon germaniums, the second sub-layer (233b) including hydrogenated micro-crystalline silicon ( $\mu\text{c-Si:H}$ ) and an amorphous silicon network ( $\text{a-Si:H}$ ) formed among the hydrogenated micro-crystalline silicons.

**FIG. 1**



**EP 2 273 563 A3**



EUROPEAN SEARCH REPORT

Application Number  
EP 10 16 0268

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)	
X	JP 9 191117 A (MITSUI TOATSU CHEMICALS) 22 July 1997 (1997-07-22)	1-8	INV. H01L31/075 H01L31/18 H01L31/0368 H01L31/0376	
A	* the whole document *	9-26		
X	JP 2006 100611 A (SANYO ELECTRIC CO) 13 April 2006 (2006-04-13)	1-8		
A	* figure 1 *	9-26		
A	WRONSKI C R ET AL: "Phase engineering of a-Si:H solar cells for optimized performance", SOLAR ENERGY, PERGAMON PRESS. OXFORD, GB, vol. 77, no. 6, 1 December 2004 (2004-12-01), pages 877-885, XP004661828, ISSN: 0038-092X, DOI: 10.1016/J.SOLENER.2004.03.008 * abstract *	1-26		
A	David E Carlson ET AL: "Amorphous Silicon Solar Cells" In: "Practical Handbook of Photovoltaics", 1 January 2003 (2003-01-01), Elsevier, Oxford, XP55009725, ISBN: 978-1-65-617390-4, pages 281-315, * the whole document *	1-26		
				TECHNICAL FIELDS SEARCHED (IPC)
				H01L
The present search report has been drawn up for all claims				
Place of search Berlin		Date of completion of the search 29 October 2012	Examiner Le Meur, M	
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document		

1  
EPO FORM 1503 03.02 (P04C01)



EUROPEAN SEARCH REPORT

Application Number  
EP 10 16 0268

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	ITO M ET AL: "Silicon thin film solar cells deposited under 80<sup>o</sup>C", THIN SOLID FILMS, ELSEVIER-SEQUOIA S.A. LAUSANNE, CH, vol. 383, no. 1-2, 15 February 2001 (2001-02-15), pages 129-131, XP004317319, ISSN: 0040-6090, DOI: 10.1016/S0040-6090(00)01590-X * the whole document *	1-26	
A	BERNHARD N ET AL: "BANDGAP ENGINEERING OF AMORPHOUS SEMICONDUCTORS FOR SOLAR CELL APPLICATIONS", PROGRESS IN PHOTOVOLTAICS: RESEARCH AND APPLICATIONS, JOHN WILEY & SONS, LTD, vol. 3, no. 3, 1 May 1995 (1995-05-01), pages 149-176, XP000537258, ISSN: 1062-7995 * figure 22 *	1-26	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 29 October 2012	Examiner Le Meur, M
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

1  
EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 16 0268

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-10-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 9191117 A	22-07-1997	NONE	
JP 2006100611 A	13-04-2006	JP 4530785 B2 JP 2006100611 A	25-08-2010 13-04-2006

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82