

28th Annual EU Photovoltaic Solar Energy Conference (PVSEC) 2013, Paris, France

## Nines PV will attend the 28th Annual PVSEC conference – 1st to the 3rd of October 2013



9s Photovoltaics will present data on its revolutionary atmospheric dry etch technology intended for multi/mono-Si solar cell development & manufacturing. Data recently generated at Faunhofer ISE demonstrating cell efficiency, carrier lifetimes, throughput and a significant reduction of CoO versus wet & plasma etch will be presented.

The Nines PV team will be available to discuss the technical developments and findings during the conference during the two poster session below (full details of these can be found in Annex 1 and 2 to this document). They have recently launched their first R&D product.

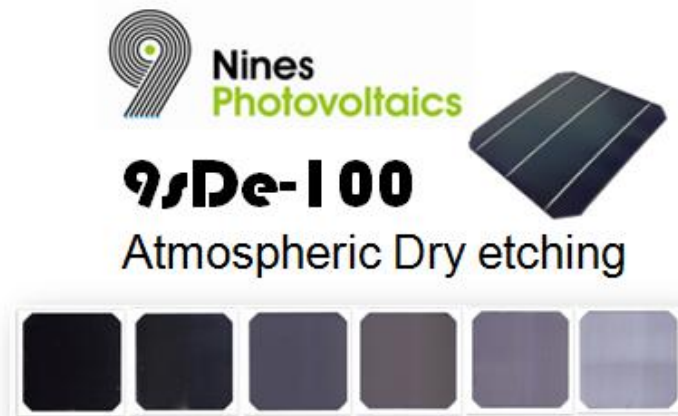
Day	Time	Location/Room	Session	Presentation title	Annex
Tue 10.01	13.30 15.00	Hall 3 Poster Area	2BV.2 Silicon Solar Cell Improvements	<b>2BV.2.40</b> Industrial Screen Printed Solar Cells with Novel Atmospheric Pressure Thermo-Chemical Dry Texturing Process	<b>1</b>
Wed 10.02	17.00 18.30	Hall 3 Poster Area	2CV.4 Silicon Solar Cell Characterisation and Modelling / Manufacturing Issues and Processing	<b>2CV.4.47</b> In-Line FTIR Gas Spectroscopy for the Analysis of Gaseous Emissions of Novel Industrial Atmospheric Pressure Dry Etching Process	<b>2</b>

PVSEC 2013, the 28 International Conference of Photovoltaic Solar Energy, will focus on advanced technologies and materials for crystalline silicon solar cells and modules. Participants include, Scientists and engineers, R&D experts from companies, research institutes, and universities, companies from each link in the supply chain and representatives from finance and investment. The PVSEC has an excellent reputation as a combined international conference, high-technology exhibition and networking event.

Dates:	01 - 03 October 2013
Exhibitor Hours:	Tuesday 01 October 2013 09:00 - 18:00 Wednesday 02 October 2013 09:00 - 18:00 Thursday 03 October 2013 09:00 - 18:00
Venue:	Parc des Expositions de Paris Nord Villepinte ZAC de Paris Nord II, 93420 Villepinte, France
Link:	<a href="http://www.photovoltaic-conference.com/">http://www.photovoltaic-conference.com/</a>

## About Nines Photovoltaics

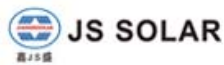
In 2008 the founders of Nines identified a niche area in the Photovoltaic (PV) industry to which they could apply their expertise from the Semiconductor Industry. Since 2010 they have been collaborating with the leading European Solar Research Institute, Fraunhofer ISE, to develop their technology. Nines Photovoltaics designs and builds production enhancing technology and processes to be used in the manufacture of PV solar cells, with a current focus on dry etching technology. Based in the Synergy Centre on the Tallaght IT Campus in Dublin, Ireland, the company is headed up by Edward Duffy CEO, Laurent Clochard CTO and Simon Forsyth CFO. <http://www.nines-pv.com>



## About EU PVSEC

For many years, the European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC) has combined a renowned international scientific Conference with a leading PV Industry Exhibition and trade fair. During 5 conference and 3 trade fair days, new products and technical innovations from all areas of Photovoltaics and from all over the world are on show.

The EU PVSEC is supported by European and international organisations such as the European Commission, UNESCO – United Nations Educational, Scientific and Cultural Organisation, Natural Sciences Sector, WCRE – World Council for Renewable Energy, ESA – European Space Agency, REN21 – Renewable Energy Policy Network for the 21st Century, EU PV TP – European Photovoltaic Technology Platform, EPIA – the European Photovoltaic Industry Association, IPVEA – the International Photovoltaic Equipment Association. The Conference Programme is coordinated by the European Commission, DG Joint Research Centre. Link: <http://www.photovoltaic-conference.com/>  
This year's Conference will be sponsored by the following:



## ANNEX 1

Date	<b>1<sup>st</sup> October 2013 (Tuesday)</b>
Time	13.30 – 15.00
Location	Hall 3 – Poster Area
Session	2BX.2 Silicon Solar Cell Improvements
Presentation	<b>2BV.2.40</b>

<b>Industrial Screen Printed Solar Cells with Novel Atmospheric Pressure Thermo-Chemical Dry Texturing Process</b>
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Authors	B. Kafle <sup>1</sup> , D. Trogus <sup>1</sup> , B. Dresler <sup>2</sup> , D. Köhler <sup>2</sup> , G. Mäder <sup>2</sup> , <b>L. Clochard<sup>3</sup></b> , <b>E. Duffy<sup>3</sup></b> , M. Hofmann <sup>1</sup> , J. Rentsch <sup>1</sup>
	<sup>1</sup> Fraunhofer ISE, <sup>2</sup> Fraunhofer IWS <sup>3</sup> Nines Photovoltaics

Abstract	<p>Dry texturing has a tremendous ability to surpass the light absorption limit of the standard wet-chemical texture. Depending upon the feature size, the sub-micron texture can effectively reduce the surface reflection property of Si by either acting as a graded density layer or by increasing the optical path length [1]. We have investigated a novel atmospheric pressure (AP) dry etching process that uses thermally activated molecular fluorine (F<sub>2</sub>) gas to texture crystalline Si surface for the solar cell application. The developed process can effectively replace the wet-chemical texturing step, while still keeping the other standard solar cell fabrication process steps mostly unchanged. We fabricated Al-BSF solar cells for the first time replacing wet-chemical texture with our AP dry etching process, while still keeping the other standard cell processes intact. We observed that an increased charge carrier recombination at the textured surface accompanied with rather inhomogeneous emitter diffusion is the major problem in fabricated solar cells. We have recently managed to keep the weighted surface reflection below 5%, while significantly improving the surface passivation level on the dry textured c-Si surface.</p>
Link	<a href="http://www.eupvsec-planner.com/presentations/c22749/industrial_screen_printed_solar_cells_with_novel_atmospheric_pressure_thermo-chemical_dry_texturing_process.htm">http://www.eupvsec-planner.com/presentations/c22749/industrial_screen_printed_solar_cells_with_novel_atmospheric_pressure_thermo-chemical_dry_texturing_process.htm</a>

## ANNEX 2

Date	<b>2<sup>nd</sup> October 2013 (Wednesday)</b>
Time	17.00 – 18.30
Location	Hall 3 – Poster Area
Session	2CV.4 Silicon Solar Cell Characterisation and Modelling / Manufacturing Issues and Processing
Presentation	<b>2CV.4.47</b>

<b>In-Line FTIR Gas Spectroscopy for the Analysis of Gaseous Emissions of Novel Industrial Atmospheric Pressure Dry Etching Process</b>
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Authors	B. Dresler <sup>2</sup> , D. Köhler <sup>2</sup> , G. Mäder <sup>2</sup> , S. Kaskel <sup>2</sup> , E. Beyer <sup>2</sup> , <b>L. Clochard<sup>3</sup>, E. Duffy<sup>3</sup></b> , B. Kafle <sup>1</sup> , M. Hofmann <sup>1</sup> , J. Rentsch <sup>1</sup>
	<sup>1</sup> Fraunhofer ISE, <sup>2</sup> Fraunhofer IWS <sup>3</sup> Nines Photovoltaics

Abstract	<p>The semiconductor industry believes in the highest level of environmental performance for its operations. Therefore technology developers and equipment suppliers have a responsibility to minimize the environmental impact of its process and operations. Moreover, equipment suppliers are expected to minimize the consumption of chemicals and production of waste emissions for industry as the end user. As an alternative to the current wet-chemical etching steps used in crystalline solar silicon industry, Fraunhofer IWS in collaboration with Nines PV and Fraunhofer ISE developed a dry-chemical etching technology at atmospheric pressure using elemental Fluorine (F<sub>2</sub>) as climate neutral etching gas.[1] For the novel dry etching process an in-line monitoring solution based on Fourier Transform Infrared (FTIR) gas spectroscopy was developed to achieve environmental performance goals.</p>
Link	<a href="http://www.eupvsec-planner.com/presentations/c24105/in-line-ftir-gas-spectroscopy-for-the-analysis-of-gaseous-emissions-of-novel-industrial-atmospheric-pressure-dry-etching-process.htm">http://www.eupvsec-planner.com/presentations/c24105/in-line-ftir-gas-spectroscopy-for-the-analysis-of-gaseous-emissions-of-novel-industrial-atmospheric-pressure-dry-etching-process.htm</a>