Sunsonix
CREATIVE CLEANING

Summer 2011 Newsletter

Sunsonix™ Selected as Arizona Innovation Challenge Winner

Sunsonix has been awarded a share of a $1.5 million grant from Arizona's Commerce Authority (ACA). Sunsonix and seven other high technology companies were selected for funding from over 100 participants. Companies were selected by a group of Venture Funds and Angel Funds working on behalf of the ACA. Winning companies were selected on their ability to attract outside capital investment, generate export sales revenue and on their position in high growth markets.

"The ACA is focused on facilitating investment in Arizona's entrepreneurs and small technology ventures," said Don Cardon, President and CEO of the ACA. "Funds from our Arizona Innovation Challenge bridge the gap between Research & Development and the commercial launch of new technologies, allowing these companies to speed to market some very promising new technology."

Sunsonix will use the funding to accelerate the commercialization of SX-E™ crystalline silicon photovoltaic cleaning solutions and develop the complementary SX-Tracer™ in-line bath chemistry monitor. The funding also facilitates more intensive process demonstration activities by Sunsonix with prospective PV wafer and cell manufacturing clients.

Sunsonix In The News…

Sunsonix has published a lead article in the second quarter issue of Photovoltaics International. For this article, entitled "Removal of trace metals using a biodegradable complexing agent", Sunsonix partnered with Evans Analytic Group (EAG), the Fraunhofer Institute for Solar Energy (ISE) and Werner Kern Associates to present the results of three years of development of Sunsonix SX-E™ chemistry to solve the not well understood wafer cleaning issues in crystalline Silicon photovoltaic cell and wafer manufacturing.

Through this work, Sunsonix and EAG developed a surface analytical technique that revealed levels of copper contamination in solar prime wafer stock not previously known. ISE reported the metal loading in representative substrate cleaning bath chemistries and the equilibrium surface contamination of transition metals. Sunsonix reports on the ability of SX-E™ chemistry to complex the metals in these baths, prevent their condensation on the wafer surface and show efficiency improvements up to 0.3% absolute for c/mc-Si PV substrates.

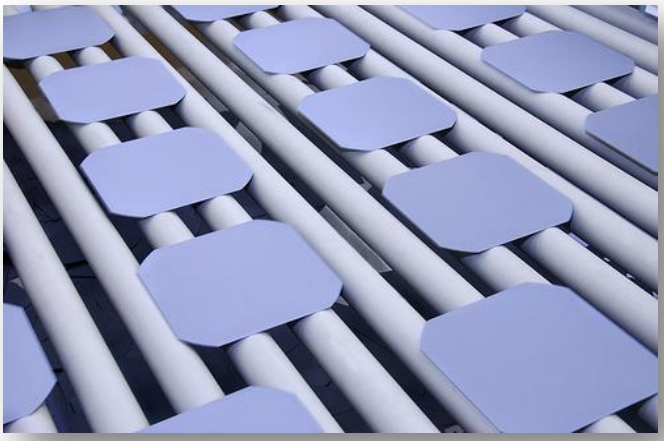
Sunsonix Presents…

Sunsonix, along with Lightwind Corporation (Petaluma, California), have been selected to present an oral presentation entitled "Optical Spectroscopy of Chelated Trace Metals for Wet Cleaning Process Control and Optimization" at the 26th European Photovoltaic Solar Energy Conference and Exhibition in Hamburg, Germany on September 7, 2011.

The oral presentation will detail the optical absorption and optical fluorescence of SX-E™ complexes that will permit real time monitoring of substrate cleaning baths. The unique complexing of metals by Sunsonix SX-E™ chemistry makes the resulting solutions optically active. Once fully developed, the SX-Tracer™ technology will provide PV process engineers with a tool to more fully optimize their manufacturing processes.

Inside This Issue

SX-E™ Efficiency Improvement by Removal of Metal Contamination from Crystalline Silicon PV Wafers



Sunsonix developed SX-E™ to increase the overall solar efficiency of crystalline silicon solar cells by targeted removal of transition metals from wafer surfaces. Metallic impurities are detrimental to solar cell efficiency due to their ability to cause recombination of charge carriers on the surface and the bulk of the solar cell, reducing the power generating capacity of the cell. Sunsonix has formulated a cleaning technology with an unparalleled ability to work in concert with existing process sequences, both acidic and alkaline, to aid the removal of surface bound transition metals without damage to the underlying silicon semiconductor. The SX-E™ solution is non-toxic and biodegradable, features consistent with the company's corporate mission to develop environmentally friendly cleaning solutions.

The source of metallic contaminants in crystalline silicon is caused by the metal wire utilized in the wafering process. The high strength steel wire used to slice wafers is cladded in successive layers of copper and nickel. As the wire is drawn through the silicon ingot, particles of the wire's metal layers are shed and deposited on the wafer surface. Once deposited on the wafer surface, these metallic impurities can quickly diffuse into the sub-surface of the silicon. Subsequent etching steps, such as texturing or saw damage, result in transference of the metals in the bulk to the newly formed surface.

With very low solubility in standard PV manufacturing cleaning processes such as KOH, HCl and HF chemistries, these metals tend to plate on the fresh silicon surface. Sunsonix's SX-E™ has been proven to reduce metallic contaminants by a factor of a 1000 or more over the standard cleaning processes and improve solar cell efficiency by greater than 0.3% absolute.

Figure 1 shows the surface contamination levels found on a random sampling of "prime" 156 mm PV wafers secured from a manufacturing line. As can be seen on this sampling the materials that comprise the wire saw are all represented in the surface contamination. Figure 1 presents a side by side comparison of surface metallic contaminant levels with standard PV processing and an optimized cleaning sequence utilizing SX-E™.

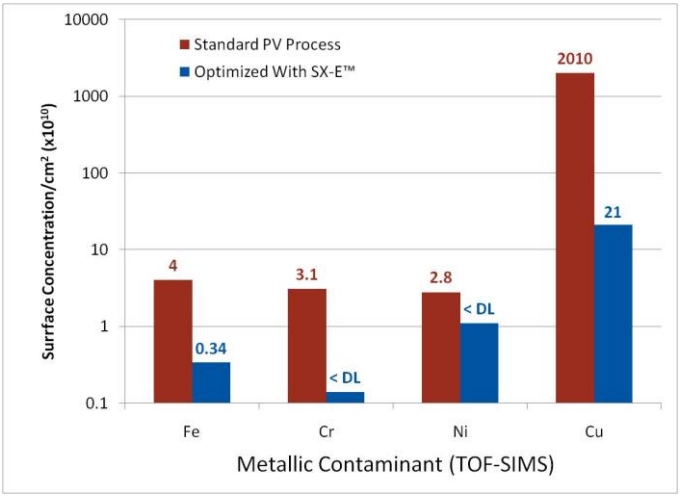


Figure 1: Surface metallic concentration for a standard PV saw damage etch (texturing) process sequence with and without SX-E™ optimized solution.

Image courtesy of Oregon DOT Solar Highway

Efficiency Improvement

Continued from page 2

By measuring the cell efficiency at individual process steps modified with the SX-E™ chemistry, one can see the cumulative improvement of cell efficiency as targeted metallic impurities are removed from the wafers' surface in each subsequent cleaning step. Results are provided in Figure 2.

The optimization of cleaning sequence with SX-E™ for a particular manufacturing line must be taken on a case by case basis. For instance, batch tools and in-line tools have differing residence times which greatly influences the efficacy of the chemical cleans employed. To complicate the situation further, in many instances, a wet bench tool manufacturer has developed their tool set to match a customer's specific requirements.

With over a 100 years of cumulative experience and expertise in semiconductor surface engineering, the Sunsonix team can provide optimization support for wet cleaning processes in existing tool sets and improve system performance by use of the SX-E™ chemistry.

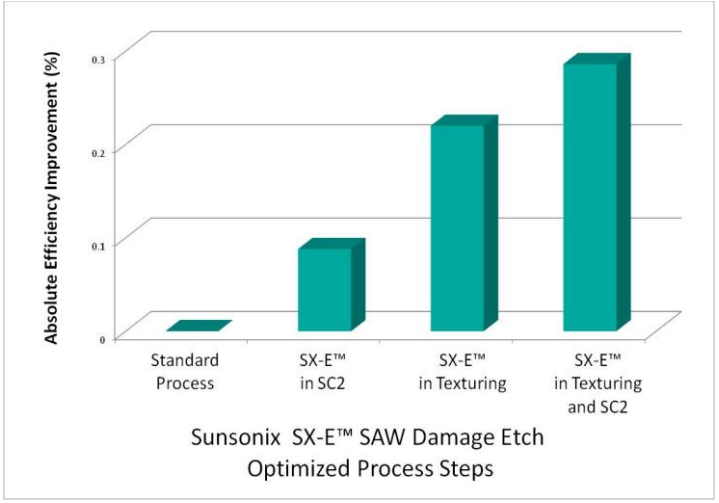


Figure 2: Cumulative improvements of SX-E™ as measured as the gain in absolute cell efficiency.

Calendar of Events

July 14-17,2011
Exhibiting: Semicon West / Intersolar
San Francisco, California
Booth 2629 South Building
Booth 5787 North Building
http://www.intersolar.us/

September 7 , 2011
26th EU PVSEC, Hamburg, Germany
Presenting: Paper 2CO.16.6 Optical Spectroscopy of Chelated Trace Metals for Wet Cleaning Process Control and Optimization
http://www.photovoltaic-conference.com/

October 10, 2011
Fall Electrochemical Society
Semiconductor Cleaning Symposium
Boston, Massachusetts
Presenting: Paper E7-2037 Surface Contamination Removal from Si PV Substrates Using A Biodegradable Chelating Agent and Detection of Cleaning Endpoints Using UV/VIS Fluorescence Spectroscopy
http://www.electrochem.org/meetings/

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