

## NA PV/PV Materials Committees Meeting Minutes

NA Fall Standards Meetings 2013

Wednesday, 30 October, 2013, 1:00 PM - 4:00 PM

SEMI HQ, San Jose, CA

### Next Committee Meeting

Wednesday, April 2, 2014, SEMI HQ, San Jose, CA in conjunction with the NA Spring Standards Meetings. Check [www.semi.org/standards](http://www.semi.org/standards) for latest update.

### Attendees:

#### SEMI Staff

Kevin Nguyen – SEMI HQ

**Co-chair** – Lori Nye (Brewer Science)

**Table 1 – Meeting Attendees**

<i>Last Name</i>	<i>First Name</i>	<i>Company</i>
Bartel	Til	Calisolar*
Baylies	Win	BayTech Group
Gotts	Hugh	Air Liquide Electronics US
Martell	Steve	Sonoscan
Nye	Lori	Brewer Science
Sinton	Ron	Sinton Instruments*

\* Attended via teleconference

**Table 2 – Organization/Task Force Changes**

None

**Table 3 – Ballot Summary**

None

**Table 4 – Authorized Ballot**

<i>#</i>	<i>When</i>	<i>SC/TF/WG</i>	<i>Details</i>
5608	Cycle 1-2014	PV Electrical and Optical Properties Measurement TF	Line-item Revision to SEMI PV13-0813, Test Method for Contactless Excess-Charge-Carrier Recombination Lifetime Measurement in Silicon Wafers, Ingots, and Bricks Using an Eddy-Current Sensor (to add literature citations for methods to determine Fe concentrations based on PV13 measurement results)

**Table 5 – Authorized Activities**

None. **Note:** existing SNARFs and TFOFs are available for review on the SEMI Web site at:

<http://downloads.semi.org/web/wstdsbal.nsf/TFOFSNARF>

**Table 6 – Previous Meeting Actions Items**

<i>Item #</i>	<i>Assigned to</i>	<i>Details</i>	<i>Status</i>
0713-1	Kevin Nguyen (SEMI Staff)	To ask SEMI Taiwan staff to contact the leader of the PV Wafer Measurement TF to roll all their activities into NA Task Forces since the scope is almost identical to that of the NA PV Electrical & Optical Measurement TF and International PV Analytical Test Methods TF	Completed. Lori asked Kevin to follow up the Taiwan group to ensure these activities folded into the NA TFs.
0713-2	Peter Wagner	To email the author of ballot 5382A, New Standard: Specification for Quasi-monocrystalline Silicon Wafers used in Photovoltaic Solar Cells, for the latest draft	Completed
0713-3	Kevin Nguyen (SEMI Staff)	To ask SEMI China staff to contact the leader of PV Power Station Equipment Integrated Performance TF and remind him/her that the charter of this TF is out of SEMI PV Standards' Scope	Completed
0713-4	Kevin, Chris Moore (Semilab), and Danh Nguyen (LEI)	To work on the call for participation letter for the round robin of PV28-0212 Test Methods for Measuring Resistivity or Sheet Resistance with a Single-Sided Noncontact Eddy-Current Gauge	Completed. Call for participation is posted on the SEMI web site.
0713-5	Kevin Nguyen (SEMI Staff)	To ask Paul Trio (SEMI Staff) to add patent discussion on the next NARSC agenda	Completed
0713-6	Kevin Nguyen (SEMI Staff)	To inform Paul Trio (SEMI Staff) on the recommended changes to the PV Materials charter. The charter will be then sent to the GCS for further discussion.	Completed

**Table 7 – New Actions Items**

<i>Item #</i>	<i>Assigned to</i>	<i>Details</i>
0713-1	Kevin Nguyen (SEMI Staff)	To ask SEMI Taiwan staff to contact the leader of the PV Wafer Measurement TF to roll all their activities into NA Task Forces since the scope is almost identical to that of the NA PV Electrical & Optical Measurement TF and International PV Analytical Test Methods TF. <ul style="list-style-type: none"> <li>To follow up with Taiwan group to ensure these activities are folded into the NA TFs and ensure that there is no potential duplication</li> </ul>
1013-1	Hugh Gotts (Air Liquide)	To ask Patrick Schnabel (Evans Analytical) to consider revising <i>SEMI PV25-1011 Test Method for Simultaneously Measuring Oxygen, Carbon, Boron and Phosphorus in Solar Silicon Wafers and Feedstock by Secondary Ion Mass Spectrometry</i> to include Aluminum in the test method as requested by Til Bartel (Calisolar)
1013-2	Hugh Gotts (Air Liquide)	To examine new statistical methods (short run) to address a method round robin studies where a limited number of analysis facilities are available and report at the next meeting.

### 1.0 Call to Order

Lori Nye called the meeting to order and welcomed everyone who attended. A round of self-introduction was made. All SEMI standards meetings are subjected to SEMI Anti-Trust Reminder and Guidelines concerning Patentable Technology. SEMI Regulations now require all attendees to be members of SEMI standards. Membership enrollment is at [www.semi.org/standardsmembership](http://www.semi.org/standardsmembership). The agenda was reviewed and approved.

### 2.0 Review and Approval of Meeting Minutes from Intersolar NA Meeting in San Francisco, CA, July 10, 2013

Minutes were reviewed. No change was made.

**Motion:** To accept the minutes as written.

**By / 2<sup>nd</sup>:** Win Baylies (BayTech Group)/Hugh Gotts (Air Liquide)

**Discussion:** None

**Vote:** 4/0. Motion passed

[Attachment – 1, NAPVMaterialsMeetingMinutes20130710](#)

### 3.0 Staff Report

Report was given by Kevin Nguyen. Highlights.

- 2013 & 2014 Event

<i>Event Name</i>	<i>Event Details</i>
<b>PV Taiwan</b>	<b>October 30 – November 1, 2013 Taipei</b>
<b>SEMICON Japan</b>	<b>December 4-6, 2013 Chiba</b>
<b>SEMICON Korea</b>	<b>February 12-14, 2014 Seoul</b>
<b>LED Korea</b>	<b>February 12-14, 2014 Seoul</b>
<b>SEMICON China</b>	<b>March 18-20, 2014 Shanghai</b>
<b>SEMICON Singapore</b>	<b>April 23-25, 2014 Marina Bay Sands</b>
<b>SEMICON West</b>	<b>July 8-10, 2014 San Francisco, California</b>

- NA Standards 2014 Meetings
  - NA Standards Spring 2014 Meetings,
    - March 31 – April 3, 2014
    - SEMI HQ in San Jose, California
  - NA Standards Meetings at Intersolar NA 2014,
    - July 7-10, 2014
    - San Francisco, California
  - NA Standards Fall 2014 Meetings,
    - November 3-6, 2014
    - SEMI HQ in San Jose, California
- Technical Ballot Critical Dates
  - Cycle 8, 2013

- Ballot Submission Date: Nov 15, 2013
- Voting Period Starts: Nov 29, 2013
- Voting Period Ends: Dec 31, 2013
- Cycle 1, 2014
  - Ballot Submission Date: January 3, 2014
  - Voting Period Starts: January 14, 2014
  - Voting Period Ends: February 13, 2014
- Cycle 2, 2014
  - Ballot Submission Date January 31, 2014
  - Voting Period Starts: February 14, 2014
  - Voting Period Ends: March 17, 2014
- September 2013 Publication Cycle
  - New Standards: 3
  - Revised Standards: 2
  - Reapproved Standards: 6
  - Withdrawn Standards: 0
- Total SEMI Standards in portfolio: 892
  - Includes 98 Inactive Standards

[Attachment – 2, SEMI Staff Report \(Fall 2013\)](#)

#### 4.0 Liaison Report

##### 4.1 European PV Committee

Report was given by Kevin Nguyen. Highlights.

- Last meeting
  - Oct 7, 2013
  - SEMICON Europa
  - Dresden, Germany
- Next meeting
  - June 2014
  - Intersolar Europe
  - Munich, Germany
- Ballot Results Summary from October meeting
  - Doc 5565, Line Item Revision to PV42, Test Method for In-Line Measurement of Waviness on PV Silicon Wafers by a Light Sectioning Technique Using Multiple Line Segments – PASSED
  - Doc 5433, New Standard, Test Method for In-line Characterization of PV Silicon Wafers regarding Grain Size – PASSED
  - Doc 5432, New Standard, Test Method for In-line Characterization of PV Silicon Wafers by Using Photoluminescence – PASSED
- Ballots authorized for cycle 1-2014
  - Doc xxxx, Revision of PVxx- Test Method for In-line Characterization of PV Silicon Wafers regarding Grain Size
  - Doc xxxx, Revision of PVyy, Test Method for In-line Characterization of PV Silicon Wafers by Using Photoluminescence
- PV Silicon Materials TF
  - Published Standards
    - PV17-1012 Specification for Virgin Silicon Feedstock Materials for Photovoltaic Applications
    - PV39-0912 Test Method for In-Line Measurement of Cracks in PV Silicon Wafers by Dark Field Infrared Imaging

- PV40-0912 Test Method for In-Line Measurement of Saw Marks on PV Silicon Wafers by a Light Sectioning Technique Using Multiple Line Segments
- PV41-0912 Test Method for In-Line, Noncontact Measurement of Thickness and Thickness Variation of Silicon Wafers for PV Applications Using Capacitive Probes
- PV42-0113 Test Method for In-Line Measurement of Waviness of PV Silicon Wafers by a Light Sectioning Technique Using Multiple Line Segments
- PV Ribbon TF
  - Published:
    - PV18-0912 Guide for Specifying a Photovoltaic Connector Ribbon
    - PV19-0712 Guide for Testing Photovoltaic Connector Ribbon Characteristics
- SEMI Europe Staff
- Yann Guillou , SEMI Europe [yguillou@semi.org](mailto:yguillou@semi.org)

[Attachment – 3, EU PV Materials Liaison Report 20131022](#)

#### 4.2 Japan PV/PV Materials Committee

Report was given by Kevin Nguyen. Highlights

- Last Meeting
  - October 24, 2013 at SEMI Japan Office, Tokyo, Japan
- Next Meeting
  - December 13, 2013 at SEMI Japan Office, Tokyo, Japan
- Japan PV Materials TF
  - Drafting Doc. #5417 “New Standard: Test Method for Measurement of Defects in PV Silicon Wafers in PV Modules by Electroluminescence (EL) Imaging”
  - Drafting Doc. #5532, “New Standard: Test Method for Measurement of Cracks in PV Silicon Wafers in PV Modules by Laser Scanning”
- SEMI Japan Staff (Hiro’fumi Kanno, [hkanno@semi.org](mailto:hkanno@semi.org))

[Attachment – 4, JA\\_PV\\_PVM\\_to NA PV\\_PVM\\_R0.1](#)

#### 4.3 Taiwan PV Committee

No new report was submitted. Highlights of the report are shown.

- Last meeting
  - May 23, 2013
  - SEMI Office, Hsinchu
- Next meeting
  - July 25, 2013
  - SEMI Office, Hsinchu
- Organic and Dye Sensitized Solar Cell TF <New>
  - Charter
    - The objective is to develop technical Standards related to organic photovoltaic (OPV) and dye sensitized solar cell (DSSC), including new test methods, standardization and evaluation of OPV/DSSC products and components.
  - Drafting:
    - Doc. 5597, New Standard: Test Method for Current-Voltage (I-V) Performance Measurement of Dye Sensitized Solar Cell (DSSC)
    - Doc. 5598, New Standard: Durability Test Method of Dye Sensitized Solar Cell (DSSC) in Subtropical Climates

- Doc. 5599, New Standard: Test Method for Spectrum Response (SR) Measurement of Dye Sensitized Solar Cell (DSSC)
- PV Wafer Measurement Method TF
  - Develop Standards for PV Si Wafer Metrology such as Geometry (Dimensions, TTV, Warp/Sori) Electrical Characteristics (Resistivity, Carrier Lifetime), Visible and Non-Visible Defects, Saw-Mark, and Stain on Wafer Surface for c-Si (both Mono- and Multi-) wafer manufacturing.
    - It was discussed that the charter of this task force is very similar to what the NA Analytical Test Methods TF and PV Electrical & Optical Properties Measurement TF. Action Item 1 - Kevin Nguyen was advised to inform the Taiwan TF leader to roll these activities into the NA region due to overlapping.
- Regional Staff Contact Information
  - Cher Wu ([cwu@semi.org](mailto:cwu@semi.org))

[Attachment – 5, Taiwan PV\\_Liaison\\_20130619](#)

#### 4.4 China PV Committee

Kevin Nguyen reported. Highlights

- Last meeting
  - China Winter Standards Meeting 2013
  - Wuxi, China
  - Wednesday, October 23, 2013
- Next meeting
  - China Spring Standards Meeting 2014
  - Shanghai, China
  - Thursday, March 20th, 2014
  - Check [www.semi.org/standards](http://www.semi.org/standards) for latest update
- Crystalline Silicon Solar Cell Task Force (new!)
  - Charter: Develop standards for specifications, guidelines and test methods related to crystalline silicon solar cell.
  - Drafting
    - Doc. 5659: New Standard: Test Method for C-Si Solar Cell Color (new SNARF)
- PV Silicon Wafer TF
  - Charter: Identify standardization needs and priorities for specifications, guidelines and procedures related to silicon wafer used for manufacturing PV cells. Develop standards for measuring electrical, physical and optical properties of silicon wafer used for manufacturing PV cells.
  - Drafting:
    - Doc. 5382A, Specification for Quasi-monocrystalline Silicon Wafers used in Photovoltaic Solar Cells
      - Ballot failed at Oct. 23th TC meeting, Doc. 5382B get authorized for rebalot in Cycle 8-2013
- Crystalline Silicon PV Module TF
  - Doc. 5661, Test Method for Electrical Parameters Testing of Bifacial Solar Module (new SNARF)
  - Doc. 5660, Specification for Ultra-thin Glasses Used for Photovoltaic Modules(new SNARF)
- Metal Paste for Crystalline Silicon Solar Cells TF
  - Doc. 5426, Specification for Aluminum Paste, Used in Back Surface Field of Crystalline Silicon Solar Cells, authorized for ballot in Cycle 8-2013
  - Doc. 5427, Specification for Front Surface Silver Paste, Used in P-Type Crystalline Silicon Solar Cells , authorized for ballot in Cycle 8-2013

- Polysilicon Packaging Materials TF
  - Doc. 5428A, Specification for Impurities in Polyethylene Packaging Materials for Polysilicon Feedstock
    - Ballot approved at Oct. 23th TC meeting
    - Will be submitted to A&R SC for procedural review
- Published Standards
  - SEMI PV44-0513, Specification for Package protection technology for PV Modules
  - SEMI PV45-0513, Test Method for the content of Vinyl Acetate (VA) in Ethylene-Vinyl Acetate (EVA) applied in PV modules—Thermal Gravimetric Analysis (TGA)
  - SEMI PV47-0513, Specification for Anti-reflective-coated Glass, Used In Crystalline Silicon Photovoltaic Modules
- SEMI China Standards Contact : Kris Shen ([kshen@semi.org](mailto:kshen@semi.org))

[Attachment – 6, China Photovoltaic Committee Liaison Report20131029](#)

## 5.0 Ballots Review

5.1 There was no ballot to review.

## 6.0 Current NA Activities

### 6.1 *Int'l PV Analytical Test Methods TF/Hugh Gotts(Air Liquide)*

6.1.1 Hugh Gotts reported meeting summary. Highlights.

#### 6.1.1.1 SEMI Europe Update

Round robin for SEMI PV10-1110 Test Method for Instrumental Neutron Activation Analysis (INAA) of Silicon

- The round robin was completed by Peter Wagner. The document was published as SEMI AUX028-0213. The revision of SEMI PV10 to include AUX028 reference is still pending. No other activity was reported.

6.1.1.2 Ballot 5501, Round Robin Update – PV43-0113 Test Method for the Measurement of Oxygen Concentration in PV Silicon Materials for Silicon Solar Cells by Inert Gas Fusion Infrared Detection Method (Patrick Schnabel).

- According to ASTM E691, a minimum of 8 labs is needed to conduct the standardized round robin. So far, only 6 or 7 labs are identified. The task force will reach out for additional labs. If no new lab is identified, the task force will proceed and move forward with the data analysis.

6.1.1.3 Ballot 5435, Round Robin Update – PV25-1011 Test Method for Simultaneously Measuring Oxygen, Carbon, Boron and Phosphorus in Solar Silicon Wafers and Feedstock by Secondary Ion Mass Spectrometry (Patrick Schnabel).

- Similarly, there is a lack of participating labs. The task force will move forward with data analysis as we only have a limited number of participating labs.
- Til Bartel (Calisolar) questioned if there is any plans to include Aluminum in PV25 test method as he feels that dopant is important. Lori Nye appreciated the feedback as she explained PV25 is already published. She recommended contacting PV25 author for further consideration. **Action Item 1 - Hugh Gotts will ask Patrick to look into this request.**

6.1.1.4 Ballot 5567, Round Robin Update - SEMI PV49-0613 Method for the Measurement of Elemental Impurity Concentrations in Silicon Feedstock for Silicon Solar Cells by Bulk Digestion, Inductively Coupled-Plasma Mass Spectroscopy (Hugh Gotts).

- Will move forward once additional sample material with a broad range of elemental impurities is located – early December.
- Til Bartel expressed interest in participating in PV49 round robin. Hugh will contact Til offline for all details.

6.1.1.5 New Business

- Proposal to examine new statistical methods (short run) to address a method round robin studies where a limited number of analysis facilities are available.
  - As these round robins are struggling to attract the minimum requirement for the number of participating labs, Hugh reported the task force is looking into new statistical methods where data can be represented with the limited number of labs.
  - Lori supported the task force's proposal. She commented that we are living in a different era as we no longer have many companies in the industry as we once were. Lori advised if the new statistical method is developed, effort must be taken to ensure that it is consistent with industry wide practice.
  - Hugh reported there are several literatures readily available in the public domain. He will research and report back at the next meeting in the Spring of 2014.
  - Win Baylies also recommended Hugh to contact ASTM E691 group for advices.
- Action Item – Hugh Gotts to examine new statistical methods (short run) to address a method round robin studies where a limited number of analysis facilities are available and report at the next meeting.

See attachment for complete report.

[Attachment – 7, 2013 Fall NA PV Standards Analytical TF agenda - Final](#)

## 6.2 PV Electrical and Optical Properties Measurement TF/Chris Moore, Austin Blew (LEI)

6.2.1 Ron Sinton reported the meeting summary.

- Status of doc. 5394, New Standard: Test Method for QSS Microwave PCD measurements of Carrier Decay and Lifetime.
  - On hold due to patent issues.
- Status of doc. 4825, New Standard: Test Methods for Hg Probe Measurements of Crystalline Silicon PV Materials and Devices.
  - No progress.
- Status of doc. 5093, Auxiliary Document: Round Robin (Multi-laboratory Test) of SEMI PV9-1110 Test Method for Excess Charge Carrier Decay in PV Silicon Materials by Non-Contact Measurement of Microwave Reflectance After a Short Illumination Pulse
  - No progress.
- Status of doc. 5608, Line-item Revision to SEMI PV13-0813, Test Method for Contactless Excess-Charge-Carrier Recombination Lifetime Measurement in Silicon Wafers, Ingots, and Bricks Using an Eddy-Current Sensor (to add literature citations for methods to determine Fe concentrations based on PV13 measurement results)
  - PV13-0211 was published in Feb. 2011, with a line-item revision published in August 2013 to add the results of an interlaboratory study.



In July 2013 at the North American standards meetings, a request was made in the Silicon Wafer committee to add a paragraph to PV13 giving literature citations for methods to measure Fe in silicon using the lifetime measurements in the test-method standard.

- The line item ballot was circulated to Murray Bullis and he has no objection.

**Motion:** To authorize doc. 5608, Line Item Revision of PV13-0813 for cycle 1-2014 for review at the next meeting in Spring

**By / 2<sup>nd</sup>:** Ron Sinton (Sinton Instruments)/Steve Martell (Sonoscan)

**Discussion:** None

**Vote:** 4/0. Motion passed

### 7.0 Old Business

Lori Nye revisited old action items captured from the previous meetings. See table 6 above for update.

### 8.0 New Business

None.

### 9.0 Next Meetings

The NA PV Materials Chapter is scheduled for Wednesday, April 2, 2014 at the SEMI HQ in San Jose, CA. Check [www.semi.org/standards](http://www.semi.org/standards) for latest update.

### 10.0 Action Item Review

Summary of action was reviewed by Kevin Nguyen. If any, these can be found in the New Action Items table 7 at the beginning of these minutes.

### 11.0 Adjourn

Adjournment of the meeting was held at 2:30 PM

These minutes are respectfully submitted by:

Kevin Nguyen,  
SEMI NA Standards Committee Manager  
Phone: 408-943-7997  
Email: [knguyen@semi.org](mailto:knguyen@semi.org)

Approved by:  
Lori Nye (Brewer Science)

November 19, 2013

**Table 8 – Index of Attachment Summary**

#	Title		Title
1	<a href="#">NAPVMaterialsMeetingMinutes20130710</a>	5	<a href="#">Taiwan PV_Liaison_20130619</a>
2	<a href="#">SEMI Staff Report (Fall 2013)</a>	6	<a href="#">China Photovoltaic Committee Liaison Report20131029</a>
3	<a href="#">EU PV Materials Liaison Report 20131022</a>	7	<a href="#">2013 Fall NA PV Standards Analytical TF agenda - Final</a>
4	<a href="#">JA_PV_PVM_to NA PV_PVM_R0.1</a>		

#1 Due to file size and delivery issues, attachments must be downloaded separately. A .zip file containing all attachments for these minutes is available at [www.semi.org](http://www.semi.org). For additional information or to obtain individual attachments, please contact Kevin Nguyen at the contact information above