

NA PV/PV Materials TC Chapters Meeting Minutes

NA Meeting Fall 2015

Wednesday, November 4, 2015, 10:00 AM - 12:00 Noon

SEMI HQ, San Jose, CA

Next Committee Meeting

Wednesday, Spring April 6, 2016, San Jose, CA in conjunction with the NA Spring Standards Meeting 2016.

Check www.semi.org/standards for the latest update.

SEMI Staff

Kevin Nguyen – SEMI HQ

Co-chair – Hugh Gotts (Air Liquide)

Table 1 – Meeting Attendees

<i>Last Name</i>	<i>First Name</i>	<i>Company</i>
Bullis	Murray	Materials & Metrology*
Gotts	Hugh	Air Liquide Electronics US
Martell	Steve	Sonoscane
Moore	Chris	BayTech-Resor
Schlezinger	Asaf	Applied Materials
Sinton	Ron	Sinton Instruments
Wagner	Peter	Self*

*attended via teleconference

Table 2 – Organization/Task Force Changes

None

Table 3 – Ballots Summary

<i>Document #</i>	<i>Document Title</i>	<i>Committee Action</i>
Doc. 5802B	New Standard: Test Method for In-Line Measurement of Saw Marks on PV Silicon Wafers by Laser Triangulation Sensors	Passed
Doc. 5803B	New Standard: Test Method for In Line, Noncontact Measurement of Thickness and Thickness Variation of Silicon Wafers for PV Applications Using Laser Triangulation Sensors	Passed
Doc. 5895	Line Item Revision of SEMI PV16-0611 Specification for Nitric Acid, Used in Photovoltaic Applications	Passed
Doc. 5896	Line Item Revision to SEMI PV20-1011 Specification for Hydrochloric Acid, Used in Photovoltaic Applications	Passed
Doc. 5897	Line Item Revision to SEMI PV27-1011 Specification for Ammonium Hydroxide, Used in Photovoltaic Applications	Passed
Doc. 5898	Line Item Revision to SEMI PV28-0212 Test Methods for Measuring Resistivity or Sheet Resistance with a Single-Sided Noncontact Eddy-Current Gauge	Passed
Doc. 5899	Line Item Revision to SEMI PV30-0212 Specification for 2-Propanol, Used in Photovoltaic Applications	Passed
Doc. 5900	Line Item Revision to SEMI PV33-0212 Specification for Sulfuric Acid, Used in Photovoltaic Applications	Passed
Doc. 5901	Line Item Revision to SEMI PV36-0912 Specification for Hydrogen Peroxide, Used in Photovoltaic Applications	Passed
Doc. 5904	Reapproval of SEMI PV14-0211 Guide for Phosphorus Oxychloride, Used in Photovoltaic Applications	Passed
Doc. 5905	Reapproval of SEMI PV15-0211 Guide for Defining Conditions for Angle	Passed

<i>Document #</i>	<i>Document Title</i>	<i>Committee Action</i>
	Resolved Light Scatter Measurements to Monitor the Surface Roughness and Texture of PV Materials	
Doc. 5902	Reapproval of SEMI PV1-0211 Test Method for Measuring Trace Elements in Silicon Feedstock for Silicon Solar Cells by High-Mass Resolution Glow Discharge Mass Spectrometry	Failed and returned to TF for rework
Doc. 5903	Reapproval of SEMI PV9-0611 Test Method for Excess Charge Carrier Decay in PV Silicon Materials by Non-Contact Measurements of Microwave Reflectance After a Short Illumination Pulse	Passed

Table 4 – Authorized Ballots

<i>#</i>	<i>When</i>	<i>SC/TF/WG</i>	<i>Details</i>
Doc. 5894	Cycle 9-15	PV Analytical Test Methods, Metrology, and Inspection TF	Line Item Revision to SEMI PV10, Test Method for Instrumental Neutron Activation Analysis (INAA) of Silicon
Doc. 5902A	Cycle 9-15	PV Analytical Test Methods, Metrology, and Inspection TF	Line Item Revision of SEMI PV1-0211, Test Method for Measuring Trace Elements in Silicon Feedstock for Silicon Solar Cells by High-Mass Resolution Glow Discharge Mass Spectrometry SNARF was revised.
Doc. 5959	Cycle 9-15	PV Analytical Test Methods, Metrology, and Inspection TF	Reapproval of SEMI PV25-1011 Test Method for Simultaneously Measuring Oxygen, Carbon, Boron And Phosphorus in Solar Silicon Wafers and Feedstock by Secondary Ion Mass Spectrometry
Doc. 5960	Cycle 9-15	PV Analytical Test Methods, Metrology, and Inspection TF	Reapproval of SEMI PV21-1011 Guide for Silane (SiH ₄), Used in Photovoltaic Applications
Doc. 5961	Cycle 9-15	PV Analytical Test Methods, Metrology, and Inspection TF	Reapproval of SEMI PV24-1011 Guide for Ammonia (NH ₃) in Cylinders, Used in Photovoltaic Applications
Doc. 5962	Cycle 9-15	PV Analytical Test Methods, Metrology, and Inspection TF	Reapproval of SEMI PV26-1011 Guide for Hydrogen Selenide (H ₂ Se) in Cylinders, Used in Photovoltaic Applications

Table 5 – Authorized Activities

<i>#</i>	<i>Type</i>	<i>SC/TF/WG</i>	<i>Details</i>
Doc. 5902	SNARF	PV Analytical Test Methods, Metrology, and Inspection TF	Line Item Revision of SEMI PV1-0211 Test Method for Measuring Trace Elements in Silicon Feedstock for Silicon Solar Cells by High-Mass Resolution Glow Discharge Mass Spectrometry SNARF was revised.
Doc. 5959	SNARF	PV Analytical Test Methods, Metrology, and Inspection TF	Reapproval of SEMI PV25-1011 Test Method for Simultaneously Measuring Oxygen, Carbon, Boron And Phosphorus in Solar Silicon Wafers and Feedstock by Secondary Ion Mass Spectrometry
Doc. 5960	SNARF	PV Analytical Test Methods, Metrology, and Inspection TF	Reapproval of SEMI PV21-1011 Guide for Silane (SiH ₄), Used in Photovoltaic Applications
Doc. 5961	SNARF	PV Analytical Test Methods, Metrology, and Inspection TF	Reapproval of SEMI PV24-1011 Guide for Ammonia (NH ₃) in Cylinders, Used in Photovoltaic Applications
Doc. 5962	SNARF	PV Analytical Test Methods, Metrology, and Inspection TF	Reapproval of SEMI PV26-1011 Guide for Hydrogen Selenide (H ₂ Se) in Cylinders, Used in Photovoltaic Applications
5501	SNARF	PV Analytical Test Methods, Metrology, and Inspection TF	Auxiliary Document: Interlaboratory Study for 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

#	Type	SC/TF/WG	Details
			<ul style="list-style-type: none"> • SNARF was abolished due to lack of interest.
5503	SNARF	PV Analytical Test Methods, Metrology, and Inspection TF	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 <ul style="list-style-type: none"> • SNARF was abolished due to lack of interest.
5435	SNARF	PV Analytical Test Methods, Metrology, and Inspection TF	Auxiliary Information to include interlaboratory study for SEMI PV25-1011, Test Method for Simultaneously Measuring Oxygen, Carbon, Boron and Phosphorus in Solar Silicon Wafers and Feedstock by Secondary Ion Mass Spectrometry <ul style="list-style-type: none"> • SNARF was abolished due to lack of interest.
5567	SNARF	PV Analytical Test Methods, Metrology, and Inspection TF	New Auxiliary Document: Interlaboratory Study for PV49, Test Method for the Measurement of Elemental Impurity Concentrations in Silicon Feedstock for Silicon Solar Cells By Bulk Digestion, Inductively Coupled-Plasma Mass Spectrometry <ul style="list-style-type: none"> • SNARF was abolished due to lack of interest.

Note: 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

Item #	Assigned to	Details	Status
0415-1	Kevin Nguyen (SEMI Staff)	To inform Kris Shen to review activities in the Power Station Equipment Integrated Performance Task Force with leaders in China and recommend to disband due to out of alignment with PV Committee and SEMI's scope.	Completed
0415-2	Hugh Gotts (Air Liquide)	To contact Evans Analytical Group to provide round robins data for the Inert Gas Fusion Infrared Detection Method and Carbon Concentration by SIMS Method	Completed
0715-2	Hugh Gotts (Air Liquide) and Lori Nye (Brewer Science)	To set up a meeting with Evans Analytical Group for releasing round robins data for the Inert Gas Fusion Infrared Detection Method and Carbon Concentration by SIMS Method	Completed

Table 7 – New Actions Items

None

1.0 Call to Order

Hugh Gotts 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. The agenda was reviewed and approved.

2.0 Review and Approval of Meeting Minutes from Intersolar NA Standards Meeting, San Francisco, CA, July 15, 2015

Minutes were reviewed. No change was made.

Motion: To accept the minutes as written.

By / 2nd: Ron Sinton/Steve Martell

Discussion: None

Vote: Unanimous. Motion passed

[Attachment – 1, NAPVMaterialsMeetingMinutes20150715](#)

3.0 Staff Report

Report was given by Kevin. Highlights:

- Upcoming NA Meetings
 - 2016
 - NA Spring, April 4-7, 2016, at SEMI HQ in San Jose, California
 - SEMICON West, July 11-14, 2016, San Francisco, California
- 9 ballot cycles for 2016
 - <http://www.semi.org/Standards/Ballots>
- SEMI Standards Publications
 - Total SEMI Standards in portfolio: 949
- New Requirements/Process Reminders for TC Chapter Meetings from December 2014 Regulations
 - Standards Document Development Project Period
 - Project period shall not exceed 3 years (Regs 8.3.2)
 - If document development activity is found to be continuing, but cannot completed with the project period, TC Chapter may grant one-year extension at a time, as many times as necessary.
 - SNARF Review Period
 - A submitted SNARF for a new, or for a major revision to an existing, Standard or Safety Guideline is made available to all members of a TC Chapter's parent global technical committee for two weeks for their review and comment. (Regs 8.2.1)
 - If the SNARF is submitted at a TC Chapter meeting, the committee can review and approve, but the SNARF will need to be distributed for two weeks and then approved via GCS.
 - Procedures for Correcting Nonconforming Titles of Published Standards Document (PM Appendix 4)
 - Some Standards qualify for a special procedure where a line item change can be used to correct the titles. Otherwise, the corrective action will likely require a major revision.
 - **5 Year Review**
 - The following standards are due for 5 year review
 - SEMI PV25-1011 Test Method for Simultaneously Measuring Oxygen, Carbon, Boron And Phosphorus in Solar Silicon Wafers and Feedstock by Secondary Ion Mass Spectrometry
 - SEMI PV21-1011 Guide for Silane (SiH₄), Used in Photovoltaic Applications
 - SEMI PV24-1011 Guide for Ammonia (NH₃) in Cylinders, Used in Photovoltaic Applications

- SEMI PV26-1011 Guide for Hydrogen Selenide (H₂Se) in Cylinders, Used in Photovoltaic Applications

Motion: To send 5 year reapproval ballot for cycle 9

By / 2nd: Chris Moore/Ron Sinton

Discussion: If any of these standards need revision, a SNARF may be issued.

Vote: 4-0 in favor. Motion passed

- **3 Year Status SNARF.**

- The following SNARF is coming up for the maximum 3 year project period.
 - Doc. 5567, New Auxiliary Document: Interlaboratory Study for PV49, Test Method for the Measurement of Elemental Impurity Concentrations in Silicon Feedstock for Silicon Solar Cells By Bulk Digestion, Inductively Coupled-Plasma Mass Spectrometry
 - SNARF was approved on 11/10/2010

[Attachment – 2, SEMI Staff Report \(10 22 2015\) PV](#)

4.0 Liaison Reports

4.1 European PV Materials Committee

Report was given by Peter Wagner. Highlights.

- Last meeting
 - June 11, 2015
 - Intersolar Europe
 - Munich, Germany
- Next meeting
 - TBD
- New TFOF/SNARF
 - PV Material Degradation Task Force
 - Leaders:
 - Dr. Köntopp Max (Hanwha Q-Cells)
 - Dr. Hagendorf Christian (Fraunhofer CSP)
 - Doc. 5889, New Standard: Test Method on Cell Level For Potential-induced Degradation Susceptibility Of Solar Cells And Module Encapsulation Materials
 - This test method is patented. Letter of Intent has been sent to SEMI Europe staff.
- SEMI Europe Staff. Andrea Busch is no longer with SEMI. For interim, please contact.
 - Kevin Nguyen (knguyen@semi.org)

[Attachment – 3, 170715_Europe_PVMat_LiaisonReport](#)

4.2 Japan PV/PV Materials Committee

No report.

4.3 Taiwan PV Committee

Highlights. Report given by Kevin.

- Last meeting
 - Oct 15
 - Nankang Exhibition Center (PV Taiwan)
- Next meeting
 - Jan 21, 2016
 - ITRI
- Ballots

- SEMI Doc 5647 Test Method for Spectrum Response (SR) Measurement of Organic Photovoltaic (OPV) and Dye-Sensitized Solar Cell (DSSC) was published as PV69-1015
- Drafting documents.
 - SEMI Doc 5560 - Classification of BIPV – Part 1: Classification of BIPV Module Dimension
 - SEMI Doc 5598 - Test Method for Durability of Low Light Intensity Organic Photovoltaic (OPV) and Dye Sensitized Solar Cell (DSSC)
 - SEMI Doc 5739 -Test Method to Evaluate an Accelerated Thermo Humidity Resistance of PV Encapsulants
 - SEMI Doc 5740 -Test Method of Electrochemical Corrosion for PV Module
- Regional Staff Contact Information.
 - Andy Tuan (atuan@semi.org)

[Attachment – 4, Taiwan PV Liaison Report Oct 2015 \(NARSC\)](#)

4.4 China PV Committee

Kevin reported. Highlights

- Last Meeting
 - Friday, July 31st, 2015
 - Qingdao, Shandong, China
- Next Meeting
 - Shenzhen, China
 - Friday, November 20th, 2015
- 3 New SNARFs:
 - PV Module TF: Doc 5925, New Standard: Specification for Dual-glass Module with Crystalline Silicon Terrestrial Solar Cell
 - Thin Film PV Module TF: Doc 5926, New Standard: Test Method for Bending Property of Flexible Thin Film PV Modules
 - PV Silicon Wafer TF: Doc 5927, Revision of SEMI PV22-1011, Specification for Silicon Wafers for Use in Photovoltaic Solar Cells
- 3 Ballots will be in Cycle 7-2015:
 - Thin Film PV Module TF: Doc 5478, New standard: Test Method for Thin-film Silicon PV Modules Light Soaking (Cycle 7-2015)
 - PV Silicon Raw Materials TF: 5564C, New standard: Test Method for the Measurement of Chlorine in Silicon by Ion Chromatography (Cycle 7-2015)
 - PV Silicon Wafer TF: Doc 5927, Revision of SEMI PV22-1011, Specification for Silicon Wafers for Use in Photovoltaic Solar Cells (Cycle 8-2015)
- 2 Docs withdrew from PV Power Station Equipment Integrated Performance TF (due to out of PV committee scope):
 - Doc 5648, New standard: Test Method for the Integrated Efficiency of Installed PV Components
 - Doc 5729, New standard: Specification for Hotspot in Crystalline Silicon PV Modules in the Field
- SEMI China Standards Contact : Kris Shen (kshen@semi.org)

[Attachment – 5, China Photovoltaic Committee Chapter Liaison Report20150807](#)

5.0 Ballots Review

- 5.1 Doc. 5802B, New Standard: Test Method for In-Line Measurement of Saw Marks on PV Silicon Wafers by Laser Triangulation Sensors
 - Ballot passed. See attached for ballot adjudication.
- 5.2 Doc. 5803B, New Standard: Test Method for In Line, Noncontact Measurement of Thickness and Thickness Variation of Silicon Wafers for PV Applications Using Laser Triangulation Sensors
 - Ballot passed. See attached for ballot adjudication.
 - Now that these test methods were approved, the committee recommended the author to initiate round robins to validate methods. Asaf Schlezinger will look into it.
- 5.3 Doc. 5895, Line Item Revision of SEMI PV16-0611 Specification for Nitric Acid, Used in Photovoltaic Applications
 - Ballot passed. See attached for ballot adjudication.
- 5.4 Doc. 5896, Line Item Revision to SEMI PV20-1011 Specification for Hydrochloric Acid, Used in Photovoltaic Applications
 - Ballot passed. See attached for ballot adjudication.
- 5.5 Doc. 5897, Line Item Revision to SEMI PV27-1011 Specification for Ammonium Hydroxide, Used in Photovoltaic Applications
 - Ballot passed. See attached for ballot adjudication.
- 5.6 Doc. 5898, Line Item Revision to SEMI PV28-0212 Test Methods for Measuring Resistivity or Sheet Resistance with a Single-Sided Noncontact Eddy-Current Gauge
 - Ballot passed. See attached for ballot adjudication.
- 5.7 Doc. 5899, Line Item Revision to SEMI PV30-0212 Specification for 2-Propanol, Used in Photovoltaic Applications
 - Ballot passed. See attached for ballot adjudication.
- 5.8 Doc. 5900, Line Item Revision to SEMI PV33-0212 Specification for Sulfuric Acid, Used in Photovoltaic Applications
 - Ballot passed. See attached for ballot adjudication.
- 5.9 Doc. 5901, Line Item Revision to SEMI PV36-0912 Specification for Hydrogen Peroxide, Used in Photovoltaic Applications
 - Ballot passed. See attached for ballot adjudication.
- 5.10 Doc. 5904, Reapproval of SEMI PV14-0211 Guide for Phosphorus Oxychloride, Used in Photovoltaic Applications
 - Ballot passed. See attached for ballot adjudication.
- 5.11 Doc. 5905, Reapproval of SEMI PV15-0211 Guide for Defining Conditions for Angle Resolved Light Scatter Measurements to Monitor the Surface Roughness and Texture of PV Materials
 - Ballot passed. See attached for ballot adjudication.
- 5.12 Doc. 5902, Reapproval of SEMI PV1-0211 Test Method for Measuring Trace Elements in Silicon Feedstock for Silicon Solar Cells by High-Mass Resolution Glow Discharge Mass Spectrometry
 - The ballot failed review and was authorized to resubmit for cycle 1 or 2 -2016 for review at the next meeting. See attached for ballot adjudication.

- 5.13 Doc. 5903, Reapproval of SEMI PV9-0611 Test Method for Excess Charge Carrier Decay in PV Silicon Materials by Non-Contact Measurements of Microwave Reflectance After a Short Illumination Pulse
- Ballot passed. See attached for ballot adjudication.

[Attachment – 6, all ballots reviews](#)

6.0 Current Activities

6.1 *Int'l PV Analytical Test Methods, Metrology, and Inspection TF/Hugh Gotts (Air Liquide)*

- Hugh Gotts reported meeting summary. Highlights.
- Ballots were reviewed – All passed excepted for doc.5902, Reapproval of PV1, Test Method for Measuring Trace Elements in Silicon Feedstock for Silicon Solar Cells by High-Mass Resolution Glow Discharge Mass Spectrometry, which requires a line item revision.
- The SNARF was revised from Reapproval to Line Item Revision to PV1.

Motion: To approve SNARF and authorize for ballot for review at the next meeting

By / 2nd: Steve Martell/Chris Moore

Discussion: None

Vote: 4/0. Motion passed

- Old business
 - Round Robins:
 - The following round robins are no longer pursuing.
 - Doc. 5501, Auxiliary Document: Interlaboratory Study for 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
 - Doc. 5503, 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
 - Doc. 5435, Auxiliary Information to include interlaboratory study for SEMI PV25-1011, Test Method for Simultaneously Measuring Oxygen, Carbon, Boron and Phosphorus in Solar Silicon Wafers and Feedstock by Secondary Ion Mass Spectrometry
 - Doc. 5567, New Auxiliary Document: Interlaboratory Study for PV49, Test Method for the Measurement of Elemental Impurity Concentrations in Silicon Feedstock for Silicon Solar Cells By Bulk Digestion, Inductively Coupled-Plasma Mass Spectrometry

Motion: To abolish these SNARFs due to lack of interest

By / 2nd: Steve Martell/Chris Moore

Discussion: None

Vote: 5/0. Motion passed

- Doc. 5801, New Standard: Guide for Performance of Round Robin Studies – Chris Moore
 - A teleconference will be set up in the next few weeks to review a preliminary draft.

Attachment – 7, PV1 SNARF revision

Attachment – 8, 2015 Fall NA PV Standards Analytical TF agenda Rev 1

7.0 Old Business

All old business was completed.

8.0 New Business

- 8.1 Approval of doc. 5894, Line Item Revision to SEMI PV10, Test Method for Instrumental Neutron Activation Analysis (INAA) of Silicon, for letter ballot
- Peter presented draft 5894 for ballot.

Motion: To authorize ballot 5894 for cycle 9-15 or 1-16 for review at the next meeting.

By / 2nd: Steve Martell/Chris Moore

Discussion: None

Vote: 5/0. Motion passed

- 8.2 Lori Nye is no longer with Brewer Science. The committee is considering Ron Sinton for the next possible TC co-chair candidate for her replacement.

9.0 Next Meetings

The next NA PV/PV Materials TC Chapter is scheduled for Wednesday, April 6, 2016 at the SEMI HQ, San Jose, CA. Check www.semi.org/standards for latest update. Tentatively, the meeting schedule is proposed as shown.

- Task Force 9:00-10:00 AM
- Committee 10:00 AM -12:00 PM

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 11:35 AM

These minutes are respectfully submitted by:

Kevin Nguyen,
SEMI Standards Operations Manager
Phone: 408-943-7997
Email: knguyen@semi.org

Approved by:
Hugh Gotts (Air Liquide)

Table 8 – Index of Attachment Summary

#	Title		Title
1	NAPVMaterialsMeetingMinutes20150715	5	China PV Committee Chapter Liaison Report20150807
2	SEMI Staff Report (10 22 2015) PV	6	all ballots reviews
3	170715_Europe_PVMat_LiaisonReport	7	PV1 SNARF revision
4	Taiwan PV Liaison Report Oct 2015 (NARSC)	8	2015 Fall NA PV Standards Analytical TF agenda Rev 1

#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. For additional information or to obtain individual attachments, please contact Kevin Nguyen at the contact information above