NA PV/PV Materials TC Chapters Meeting Minutes

Intersolar North America 2014
Wednesday, 9th July, 2014, 1:00 PM - 4:00 PM
San Francisco Marriott Marquis, San Francisco, CA

Next Committee Meeting
Wednesday, November 5, 2014, San Jose, CA in conjunction with NA Fall Standards Meetings. Check www.semi.org/standards for the latest update.

SEMI Staff
Kevin Nguyen – SEMI HQ

Co-chair – Lori Nye (Brewer Science)

Table 1 – Meeting Attendees

Last Name	*First Name*	*Company*
Asakawa	Terry	Tokyo Electron
Baylies	Win	BayTech-Resor
Gotts	Hugh	Air Liquide Electronics US
Li	Zhixin	Linton Machine
Moore	Chris	BayTech-Resor
Murata	Naoko	Tokyo Electron
Sinton	Ron	Sinton Instruments
Wagner	Peter	Self

Table 2 – Organization/Task Force Changes

Group	*New Leader*
International PV Analytical Test Methods Task Force was renamed to International PV Analytical Test Methods, Metrology, and Inspection Task Force	Ron Sinton (Sinton Instruments) Chris Moore (BayTech-Resor)

Table 3 – Ballot Summary
None

Table 4 – Authorized Ballot
None

Table 5 – Authorized Activities
None

Table 6 – Previous Meeting Actions Items
None

Table 7 – New Actions Items

Item #	*Assigned to*	*Details*
0714-1	Hugh Gotts (Air Liquide)	To follow up with Brent Ames (Applied Materials) for various SNARFs on Test Method for Metrology of Bare cSi Wafers.
0714-2	Peter Wagner (Self)	To contact Kris Shen (China) and Andy Tuan (Taiwan) to engage interest in round robin participation on SEMI PV40, 41, 42 and 46
0714-3	Chris Moore, Hugh Gotts and Win Baylies	To prepare a SNARF for a Guideline for Round Robin
0714-4	Hugh Gotts (Air Liquide)	To conduct 5 year review of SEMI PV3 Guide for High Purity Water Used in Photovoltaic Cell Processing, 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. The agenda was reviewed and approved.

2.0 Review and Approval of Meeting Minutes from NA Spring Meeting , San Jose, CA, April 2, 2014

Minutes were reviewed. No change was made.

Motion: To accept the minutes as written.
By / 2nd: Hugh Gotts (Air Liquide)/Chris Moore (BayTech-Resor)
Discussion: None
Vote: 5/0. Motion passed

Attachment – 1, NAPVMaterialsMeetingMinutes20140402

3.0 Staff Report

Report was given by Kevin Nguyen. Highlights.

- 2014 Event

Event Name	*Event Details*
SEMICON West	July 8-10, 2014 San Francisco, California
SEMICON Taiwan	September 3-5, 2014 Taipei
SEMICON Europa Plastic Electronics	October 7-9, 2014 Grenoble, France
SEMICON Japan	December 3-5, 2014 Tokyo

- NA Standards 2014 Meetings
  - NA Standards Fall 2014 Meetings
    - November 3-6, 2014 [SEMI HQ in San Jose, California]
- Technical Ballot Critical Dates
  - Cycle 5, 2014
    - Ballot Submission Date: July 18
    - Voting Period Starts: July 25
    - Voting Period Ends: August 25
- Total SEMI Standards in portfolio: 909
  - Includes 106 Inactive Standards

Attachment – 2, SEMI Staff Report (West 2014)

4.0 Liaison Reports

4.1 PV Automation transforming to Automation Technology TC – Terry Asakawa

- With the decline in attendance and participation in the Global PV Automation Technical Committee, Terry presented the proposal to the International Standards Committee (ISC) to approve the transformation of the PV Automation Committee to Automation Technology Committee at the meeting on July 10, 2014 meeting.

- This transformation will expand the scope to cover generic automation technology generically, not exclusively to photovoltaic. All task forces previously under the PV Automation Committee will now be under the Automation Technology Committee.
- Discussion
  - Chris Moore questioned how this proposal is different from the equipment automation for semiconductor? Terry responded this is intended for FPD, HB-LED, PV…etc, but not for semiconductor in general.
  - Lori Nye recommended adding the word "Integration", so it would be Automation Integration Technology. Terry responded that the Europe Chapter already discussed such naming convention, but they thought it is best to leave as Automation Technology Committee.
- Terry also recommended all regions to look into consolidating PV Materials and PV Committees into one single committee (e.g., PV) due to decreasing level of activities in NA and Japan. Also, it would make more sense to save SEMI Staff's time and resources.

Attachment – 3, Automation_Technology_Committee_Proposal_2014_0710a

4.2 European PV Materials Committee

Report was given by Peter Wagner. Highlights.

- Last meeting
  - Oct 7, 2013
  - SEMICON Europa
  - Dresden, Germany
- Next meeting
  - October 6, 2014
  - SEMICON Europa
  - Grenoble France
- 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 and PUBLISHED as **PV52-0214**
  - Doc 5432, New Standard, Test Method for In-line Characterization of PV Silicon Wafers by Using Photoluminescence – PASSED and PUBLISHED as **PV51-0214**
- 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
- Peter also added a workshop on Round Robin was conducted at the Intersolar Europe meeting in June 2014. There were 5-6 excellent presentations. He reported that there is a need for a second workshop to be held for next year.
- SEMI Europe Staff
  - Andrea Busch (abusch@semi.org)

Attachment – 4, EU Liaison Report June 26, 2014

4.3 Japan PV/PV Materials Committee

Report was given by Kevin Nguyen. Highlights

- Last Meeting
  - July 4, 2014 at SEMI Japan Office, Tokyo, Japan
- Next Meeting
  - September 11, 2014 at SEMI Japan Office, Tokyo, Japan
- Japan PV Materials TF
  - SNARF #5417 "New Standard: Test Method for Measurement of Defects in PV Silicon Wafers in PV Modules by Electroluminescence Imaging"
    - The same topic as SNARF 5417 has been under development at IEC (International Electrotechnical Commission).
    - The task force proposed withdrawal of SNARF #5417, which was approved at the Japan Summer 2014 Meetings on July 4.
  - "Doc. 5532, New Standard: Test Method for Measurement of Cracks in PV Silicon Wafers in PV Modules by Laser Scanning"
    - Balloted for Cycle 3-2014 and passed with editorial changes at Japan Summer 2014 Meetings on July 4.
- SEMI Japan Staff (Chie Yanagisawa, cyanagisawa@semi.org)

Attachment – 5, JA_PV&PVM_SEMICONWest2014_R0.2

4.4 Taiwan PV Committee

Highlights. Report given by Kevin.

- Last meeting
  - July 1, 2014
  - SEMI Office, Hsinchu
- Next meeting
  - Oct 3, 2014
  - ITRI
- Organic and Dye Sensitized Solar Cell TF
  - 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 Package TF
  - Drafting Document 5431:New Standard :Test Method for Performance Criteria of Photovoltaic (PV) Wafer, Cell, and Module Package in process
  - Survey Horizontal Impact, Rotational Flat Drop Test specification and Equipment, Arrange test with Real and Dummy cells, Define Experimental Project and Running schedule.
- PV BIPV TF
  - Drafting Document 5560 : New Standard: Classification of Building Integrated Photovoltaic (BIPV) in progress
- Wafer Measurement Method TF
  - Leader Changed to Dr. Saumine Chen/ITRI, CMS would like to take the new leader role.

- PV Reliability Test Method Task Force
  - Drafting
    - Doc. 5739, New Standard: Test Method to Evaluate an Accelerated Thermo Humidity Resistance of PV Encapsulants
    - Doc. 5740, New Standard: Test Method of Electrochemical Corrosion for PV module
- New Regional Staff Contact Information. Cher Wu is no longer with SEMI.
  - Andy Tuan (atuan@semi.org)

Attachment – 6, Taiwan Liaison Report May 2014

4.5 China PV Committee

Kevin reported. Highlights

- Last meeting
  - Hebei, Baoding, China
  - Friday, June 13th, 2014
- Next Meeting
  - Dalian, Liaoning, China
  - Friday, September 12th, 2014

- *PV Silicon Wafer Task Force*
  - Drafting
    - Doc. 5724, Guide for Specifying Quasi-monocrystalline Silicon Wafers Used in Photovoltaic Solar Cells
- *PV Module Task Force*
  - Published
    - 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 Using Thermal Gravimetric Analysis (TGA)
    - SEMI PV47-0513, Specification for Anti-Reflective-Coated Glass, Used in Crystalline Silicon Photovoltaic Modules
  - Drafting
    - Doc. 5563, Specification for Framing Tape for PV Modules
      - Failed ballot review and returned to TF for re-work
    - Doc. 5660, Specification for Ultra-thin Glasses Used for Photovoltaic Modules
    - Doc. 5661, Test Method for Electrical Parameters Testing of Bifacial Solar Module
    - Doc. 5644, Terminology for Back Contact PV Cell and Module
      - Authorized for ballot in Cycle 5-2014
    - Doc. 5725, New Standard: Practice for Metal Wrap Through (MWT) Back Contact PV Module Assembly (New SNARF)

- *PV Diffusion Furnace Test Methods Task Force*
  - Doc. 5429: Test Method for In-line Monitoring of Flat Temperature Zone in Horizontal Diffusion Furnaces
    - Passed by TC, Published as SEMI PV53-0514

- *PV Silicon Raw Materials Task Force*
  - Published
    - SEMI PV50-0114 Specification for Impurities in Polyethylene Packaging Materials for Polysilicon Feedstock

- Activity:
  - Doc. 5476B, Test Method for Determination of Total Carbon Content in Silicon Powder by Infrared Absorption after Combustion in an Induction Furnace
    - Authorized for reballot in Cycle 5-2014
  -
  - Doc. 5477B, Test Method for Determining B, P, Fe, Al, Ca Contents in Silicon Powder for PV Applications by Inductively-Coupled-Plasma Optical Emission Spectrometry
    - Failed ballot review.
  - Doc. 5564B: Test Method for the Measurement of Chlorine in Silicon by Ion Chromatography
    - Authorized for reballot in Cycle 5-2014
  - Doc. 5699: Test Method for Interstitial Atomic Oxygen Content of Crystalline Silicon by Multiple Transmission-reflection Infrared Absorption
  - Doc. 5670: Test Method for Substituted Carbon Content of Crystalline Silicon by Multiple Transmission-reflection Infrared Absorption

- *PV Thin Film Task Force*
  - Drafting:
    - Doc. 5478: Test Method for Thin-film Silicon PV modules Light Soaking

- *PV Power Station Equipment Integrated Performance Task Force*
  - Drafting:
    - Doc. 5648: 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 (New SNARF)

- *Crystalline Silicon Solar Cell Task Force*
  - Doc. 5426, Specification for Aluminum Paste, Used in Back Surface Field of Crystalline Silicon Solar Cells
    - Failed A&R Subc for procedural review and returned to TF for re-work
  - Doc. 5427, Specification for front Surface Silver Paste, Used in P-Type crystalline Silicon Solar Cells
    - Passed by TC, Published as SEMI PV 54-0514
  - Doc. 5659, Test Method Based on RGB for C-Si Solar Cell Color
    - Failed ballot review and returned to TF for re-work
  - Doc. 5726, New Standard: Test Method for Determining the Aspect Ratio of Solar Cell Metal Fingers by Confocal Laser Scanning Microscope (New SNARF)
  - Doc. 5727, New Standard: Test Method for the Etch Rate of A Crystalline Silicon Wafer by Determining The Weight Loss(New SNARF)
- Multi-wire Saws Task Force (New TF)
  - Charter
    - Provide test methods and data support for Multi-wire saws;
    - Resolve the differences between the suppliers and users in the field of Multi-wire saws;
    - Provide the consistency and versatility of Multi-wire saws, and improve productivity and reduce the loss in the Multi-wire saws industrial chain;
    - Improve the development of standards of Multi-wire saws industry.
  - Activities:
    - Doc. 5728, New Standard: Test Method for the Wire Tension of Multi-wire Saws (New SNARF)
- SEMI China Standards Contact : Kris Shen (kshen@semi.org)

Attachment – 7, China Photovoltaic Committee Liaison Report20140624

5.0 Ballots Review

5.1 There was not ballot to review.

6.0 Current Activities

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

- Hugh Gotts reported meeting summary. Highlights.
- Europe Update
  - Revision of PV10, Test Method for Instrumental Neutron Activation Analysis (INAA) of Silicon, is pending to AUX027-0213, Round Robin for PV10
- Old business
  - Round Robin Update - Method for the Measurement of Oxygen Concentration in Silicon Feedstock for Silicon Solar Cells by Inert Gas Fusion Infrared Detection Method (Patrick Schnabel) – Data collected but not evaluated. The TF will look for additional resources to evaluate the data.
  - Round Robin Update - Method for the Measurement of Carbon Concentration in Silicon Feedstock for Silicon Solar Cells by SIMS Method (Patrick Schnabel) - Data collected but not evaluated. The TF will look for additional resources to evaluate the data.
  - Round Robin Update - Test Method for the Measurement of Elemental Impurity Concentrations in Silicon Feedstock for Silicon Solar Cells by Bulk Digestion, Inductively Coupled-Plasma Mass Spectrometry (Hugh Gotts) – Collecting additional sample material for evaluation.
- Electrical & Optical Activities (Chris Moore and Ron Sinton)
  - Chris to contact Austin regarding RR update
- New Business
  - Request changes in name and scope of the TF from "INTERNATIONAL PV ANALYTICAL TEST METHODS TASK FORCE" to "INTERNATIONAL PV ANALYTICAL TEST METHODS, METROLOGY and INSPECTION TASK FORCE"

Motion: To approve revised Task Force
By / 2nd: Hugh Gotts (Air Liquide)/Win Baylies (BayTech-Resor)
Discussion: None
Vote: 6/0. Motion passed

  - Nomination of co-Chairs – Chris Moore and Ron Sinton.

Motion: To approve two new TF leaders
By / 2nd: Chris Moore (BayTech-Resor)/Hugh Gotts (Air Liquide)
Discussion: None
Vote: 6/0. Motion passed

  - Test Method for Metrology of Bare cSi Wafers – SNARF submitted to TF however this document needs additional focus prior to submission to TC.
    - Brent Ames (Applied Materials), who submitted the SNARF, did not show up to the meeting. According to Hugh, the proposal is too broad and needs to be broken down to several SNARFs.
    - Action Item #1 – Hugh Gotts will follow up with Brent.

Attachment – 8, 2014 Summer NA PV Standards Analytical TF Update

Attachment – 9, PV Analytical TFOF

6.2 Europe PV Si Materials TF / Round Robin Report for PV40, 41, 42, 46 – Peter Wagner

- Peter presented an excellent report on the content of Round Robin according to SEMI PV40, 41, 42 and 46 for measuring lateral dimensions, thickness, thickness variations, waviness and depth of sawing grooves of multicrystalline Si wafers.
  - SEMI PV40, Test Method for In-Line Measurement of Saw Marks on PV Silicon Wafers by a Light Sectioning Technique Using Multiple Line Segments
  - SEMI PV41, Test method for In-Line, Noncontact Measurement of Thickness and Thickness Variation of Silicon Wafers for PV Applications Using Capacitive Probes
  - SEMI PV42, Test Method for In-Line Measurement of Waviness of PV Silicon Wafers by a Light Sectioning Technique Using Multiple Line Segments
  - SEMI PV46, Test method for In-Line Measurement of Lateral Dimensional Characteristics of Square and Pseudo-Square PV Silicon Wafers
- The proposed content of the round robin would include material, participant, measurement procedure, metrics, schedule, reporting, shipment, special requirement, cost, and preparation of round robin.
- According to Peter, there are already 4 labs identified for participating of the round robin, but more is welcomed. Peter can be contacted at peter.wagner@onlinehome.de
- Discussion.
  - Lori recommended Peter to check China and Taiwan to see if they want to participate on the round robin
  - Action Item # 2 – Peter to contact Kris Shen (China) and Andy Tuan (Taiwan) to engage interest in round robin participation on SEMI PV40, 41, 42 and 46

Attachment – 10, geomroundrobin

7.0 Old Business

All old businesses were completed.

8.0 New Business

8.1 Lori Nye praised Peter for his excellence work on the methodology for the content of Round Robin. Using Peter's methodology, she asked the committee if this guide should be converted to SEMI Standard Guide for Round Robin, 2-3 pages document for example.
Per Lori, this Guide could be useful for other regional committees such as China and Taiwan who may need not have the experience to conduct a round robin.

- Chris, Hugh and Win thought it would be a good idea. However, such proposal may get lengthy, could be 15 pages or more. Lori thinks the proposed Guide should not be longer than 5 pages. If it gets over 5 pages, the task force can drop the effort.
- Action Item #3 – Chris, Hugh and Win to prepare a SNARF for a Guideline for Round Robin

8.2 Kevin Nguyen informed the committee that SEMI PV3-0310 - Guide for High Purity Water Used in Photovoltaic Cell Processing, is due for 5 year review. The committee should review and take various actions with a choice of balloting for reapproval, sending to inactive list, removal or revising it.

- Action Item # 4 – Hugh Gotts will take a look at SEMI PV3 and report at the next meeting

9.0 Next Meetings

The next NA PV/PV Materials TC Chapter is scheduled for Wednesday, November 5, 2014 at the SEMI HQ office, San Jose, CA. Check 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 2:45 PM

These minutes are respectfully submitted by:

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

Approved by:
Lori Nye (Brewer Science) August 8, 2014
Hugh Gotts (Air Liquide)

Table 8 – Index of Attachment Summary

#	*Title*		*Title*
1	NAPVMaterialsMeetingMinutes20140402	6	Taiwan Liaison Report May 2014
2	SEMI Staff Report (West 2014)	7	China Photovoltaic Committee Liaison Report20140624
3	Automation_Technology_Committee_Proposal_2014_071	8	2014 Summer NA PV Standards Analytical TF Update
4	EU Liaison Report June 26, 2014	9	PV Analytical TFOF
5	JA_PV&PVM_SEMICONWest2014_R0.2	10	geomroundrobin

#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