



Compound Semiconductor Materials North America Technical Committee Chapter Meeting Summary and Minutes



SEMI®
International
Standards

CS MANTECH 2016
18 May 2016, 0700 – 0900 PM EDT
Hyatt Regency; Miami, Florida

Committee Announcements

Next Committee Meeting

CS MANTECH 2017

Wednesday, May 24, 2017 (7:00-8:00 PM PDT)

CS MANTECH Palm Springs, California

Table 1 Meeting Attendees

Italics indicate virtual participants

Co-Chairs: Jim Oliver (Northrop Grumman), Russ Kremer (Freiberger Compound Materials)

SEMI Staff: Kevin Nguyen

| <i>Company</i> | <i>Last</i> | <i>First</i> |
|-------------------------------|----------------|--------------|
| <i>BayTech-Resor</i> | <i>Baylies</i> | <i>Win</i> |
| Leighton Electronics | Benjamin | Mark |
| Freiberger Compound Materials | Kremer | Russ |
| NOVASiC | Kronwasser | Judy |
| Leighton Electronics | Nguyen | Danh |
| SEMI | Nguyen | Kevin |
| Northrop Grumman | Oliver | Jim |

Table 2 Leadership Changes

None

Table 3 Ballot Results

Passed ballots and line items will be submitted to the ISC Audit & Review Subcommittee for procedural review.

| <i>Document #</i> | <i>Document Title</i> | <i>Committee Action</i> |
|-------------------|---|-------------------------|
| 5882 | Line Item Revision to SEMI M10-1296 With Title Change To: Terminology for Identification of Structures and Features Seen on Gallium Arsenide Wafers | Passed |
| 5883 | Line Item Revision to SEMI M42-0211 Specification for Compound Semiconductor Epitaxial Wafer | Passed |
| 5884 | Line Item Revision to SEMI M65-0306 With Title Change To: Specification for Sapphire Substrates to use for Compound Semiconductor Epitaxial Wafers | Passed |
| 5885 | Line Item Revision to SEMI M75-0812 With Title Change To: Specification for Polished Monocrystalline Gallium Antimonide Wafers | Passed |
| 5886 | Line Item Revision to SEMI M9-0914 With Title Change To: Specification for Polished Monocrystalline Gallium Arsenide Wafers | Passed |

Table 4 Authorized Activities

| # | Type | SC/TF/WG | Details |
|-----|-------|----------|--|
| tbd | SNARF | CSM TC | Line Item Revision to SEMI M10 Terminology for Identification of Structures and Features Seen on Gallium Arsenide Wafers |
| tbd | SNARF | CSM TC | Reapproval of SEMI M23-0811 Specification for Polished Monocrystalline Indium Phosphide Wafers |
| tbd | SNARF | CSM TC | Reapproval of SEMI M79-0211 Specification for Round 100 mm Polished Monocrystalline Germanium Wafers for Solar Cell Applications |

Note: SNARFs and TFOFs are available for review on the SEMI Web site at:
<http://downloads.semi.org/web/wstdsbal.nsf/TFOFSNARF>

Table 5 Authorized Ballots

| # | When | SC/TF/WG | Details |
|-----|------------|----------|--|
| tbd | Cycle 1-17 | CSM TC | Line Item Revision to SEMI M10 Terminology for Identification of Structures and Features Seen on Gallium Arsenide Wafers |
| tbd | Cycle 1-17 | CSM TC | Reapproval of SEMI M23-0811 Specification for Polished Monocrystalline Indium Phosphide Wafers |
| tbd | Cycle 1-17 | CSM TC | Reapproval of SEMI M79-0211 Specification for Round 100 mm Polished Monocrystalline Germanium Wafers for Solar Cell Applications |

Table 6 New Action Items

| Item # | Assigned to | Details |
|-------------|--------------|--|
| 2016May #01 | Kevin Nguyen | Send a copy of SEMI M23 to Judy Kronwasser for review. Send a copy of SEMI M79 to Hani Badawi (AXT) for review. |

Table 7 Previous Meeting Actions Items

| Item # | Assigned to | Details | Status |
|-------------|----------------------------|---|--------|
| 2015May #01 | Paul Trio | Set-up bridge for upcoming M55 5-Year Review TF meetings. | Closed |
| 2015May #02 | Paul Trio | Send a copy of SEMI M1 to Judy Kronwasser. | Closed |
| 2015May #03 | Paul Trio, Russ Kremer | Send a copy of SEMI M79 to Hani Badawi (AXT) for review. | Closed |
| | | | |
| 2014Nov #01 | Michael Tran | Gather Global SiC TF inputs for M55 5-Year Review work. | Closed |
| 2014Nov #02 | Michael Tran | Look into status of M65 5-Year Review. | Closed |
| | | | |
| 2013May#02 | Albert Davydov | Assist Judy Kronwasser with the flats orientation of Gallium Nitride and Sapphire in Document 4979. | Closed |
| 2013May#03 | Michael Tran | Work with Judy Kronwasser on DIN standards being referenced in Document 4979. | Closed |
| | | | |
| 2011Sep #02 | Paul Trio and Kevin Nguyen | Look into the mobility standard developed by the Japan CSM committee. | Closed |
| 2011Sep #03 | Jim Oliver | Help find volunteers, possibly from Cree or II-VI, to lead the SiC Task Force. | Closed |



1 Welcome, Reminders, and Introductions

Jim Oliver, committee co-chair, called the meeting to order at 7:05 PM. After welcoming all attendees, a round of introductions followed. The SEMI meeting reminders on membership requirements, antitrust, patentable technology, and meeting guidelines were then presented and explained.

2 Review of Previous Meeting Minutes

The committee reviewed the minutes of the previous meeting held in May 2015.

Motion: Accept the minutes of the previous meeting as written.

By / 2nd: Russ Kremer / Judy Kronwasser

Discussion: None

Vote: 4-0 in favor. Motion passed.

Attachment: 01, NA CSM Minutes 2015 CSMANTECH

3 Liaison Reports

3.1 Europe Compound Semiconductor Materials Committee

Kevin Nguyen presented the Europe CSM liaison report. The key items were as follows:

- Leadership
 - Arnd Weber (SiCrystal)
 - Looking for a second cochair.
- Meetings
 - Last Meeting: April 12, 2016 (Germany)
 - Next Meeting: Tentatively in conjunction with DGKK (www.dgkk.de) Fall Meeting, date to be defined
- Global SiC Task Force
 - Leader: Arnd-Dietrich Weber, SiCrystal
 - Start technical work on review of document (M81) planned for August 2016
 - 5-year review M55 in progress (80% completed) – global task force driven by teleconference meetings
 - 3 further teleconference meetings expected
 - All major technical specifications for 2in to 150mm included
 - All sub-standards merged into one document
 - Topics in progress: edge contour, special definitions for semi-insulating (notch, thickness)
 - IP review conducted
 - Approve Balloting in fall meeting for cycle 9-2016
- Contactless Capacitive Resistivity Measurement of SI-Semiconductors TF
 - Leader: Wolfgang Jantz, Semimap
 - The contactless resistivity standard is published as M87-0116 Test Method for Contactless Resistivity Measurement of Semi-Insulating Semiconductors
 - How to conduct a round robin on known standard material with the aim to compare different tools and methods is under discussion. The material needs to be known homogeneous which may be the critical point.
 - The material shall be shipped with a thermometer-setup permanently fixed to a dummy substrate, in order to ensure comparable and precise temperature data. For GaAs temperature measurement accuracy is the critical impact on resistivity data. In contrary to SiC the activation energy of GaAs is well defined and known with good precision.

- Wolfgang Jantz will contact and invite potential participants.
- The expected results shall be added as an appendix (by a line-item ballot) to M87 in order to assist the user with representative sample data. *New!* 5-year Review TF
- Forecast of 5-Year-Reviews
 - 2016:
 - M54 (Guide for Semi-Insulating (SI) GaAs Parameters)
TF and Start do be approved in ECS Fall Meeting 2016
 - 2017: (forecast)
 - M75 (Specifications for Polished Monocrystalline Gallium Antimonide Wafers)
 - M83 (Test Method for Determination of Dislocation Etch Pit Density in Monocrystals of III-V Compound Semiconductors).

Attachment: 02, ECS Liaison Report May 2016

3.2 Japan Compound Semiconductor Materials Committee

No report. Win Baylies said there are activities in Japan especially in the autonomous automobile industry in which it requires high switching and high power in compound semiconductor. The application is there, and there could be potentially standards activities for SEMI. However, both Jim Oliver and Judy Kronwasser mentioned in the GaAs area and other standards in the past, there has been no involvement from Japan. Win Baylies will try to forward contacts from Japan to Russ and Jim.

4 Ballot Review

Passed ballots and line items will be submitted to the ISC Audit & Review Subcommittee for procedural review.

NOTE 1: Committee adjudication on Cycle 1, 2016 ballots are detailed in the Audits & Reviews (A&R) Subcommittee Forms for procedural review. These A&R forms are available as attachments to these minutes. The attachment number for each document is provided below the summary tables.

4.1 Document 5882, Line Item Revision to SEMI M10-1296 With Title Change To: Terminology for Identification of Structures and Features Seen on Gallium Arsenide Wafers

4.1.1 Ballot passed.

4.2 Document 5883, Line Item Revision to SEMI M42-0211 Specification for Compound Semiconductor Epitaxial Wafer

4.2.1 Ballot passed.

4.3 Document 5884, Line Item Revision to SEMI M65-0306 With Title Change To: Specification for Sapphire Substrates to use for Compound Semiconductor Epitaxial Wafers

4.3.1 Ballot passed.

4.4 Document 5885, Line Item Revision to SEMI M75-0812 With Title Change To: Specification for Polished Monocrystalline Gallium Antimonide Wafers

4.4.1 Ballot passed.

4.5 Document 5886, Line Item Revision to SEMI M9-0914 With Title Change To: Specification for Polished Monocrystalline Gallium Arsenide Wafers

4.5.1 Ballot passed.

Attachment: 03-07, Ballot Review Reports.



5 Task Force Reports

5.1 Gallium Nitride (GaN) Task Force

Judy Kronwasser reported for the GaN Task Force was completed. There may be new activity for larger diameter in the future.

5.2 M55 5-Year Review Task Force and Silicon Carbide Task Force

Judy Kronwasser reported that EU CSM provided inputs for the M55 5-year review and other work.

Attachment: 08, SEMI Report May 2016

5.3 Electrical Properties Task Force

No report.

5.3.1 ASTM Subcommittee F1.15 on Compound Semiconductors

No report.

5.3.2 F1.15 GaN Epitaxial Wafer Reference Material Task Force

No report.

6 Old Business

6.1 Status update on action items generated from the previous meetings. All closed.

| <i>Item #</i> | <i>Assigned to</i> | <i>Details</i> | <i>Status</i> |
|---------------|----------------------------|---|---------------|
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| 2015May #02 | Paul Trio | Send a copy of SEMI M1 to Judy Kronwasser. | Closed |
| 2015May #03 | Paul Trio, Russ Kremer | Send a copy of SEMI M79 to Hani Badawi (AXT) for review. | Closed |
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| | | | |
| 2011Sep #02 | Paul Trio and Kevin Nguyen | Look into the mobility standard developed by the Japan CSM committee. | Closed |
| 2011Sep #03 | Jim Oliver | Help find volunteers, possibly from Cree or II-VI, to lead the SiC Task Force. | Closed |



6.2 Documents due for 5-Year Review

Kevin Nguyen reported that the following NA CSM Standards are due for 5-Year Review:

- SEMI M23-0811 Specification for Polished Monocrystalline Indium Phosphide Wafers
- SEMI M79-0211 Specification for Round 100 mm Polished Monocrystalline Germanium Wafers for Solar Cell Applications
- SEMI M19-91 Specification for Electrical Properties of Bulk Gallium Arsenide Single Crystal Substrates
- SEMI M14-89 Specification for Ion Implantation and Activation Process for Semi-Insulating Gallium Arsenide Single Crystals

Additional Committee Discussion:

- SEMI M14 and M19 were published in early 1990s. Significant works must be done to bring these standards up to date since required sections are not in there. These standards should go inactive. Per SEMI Regulations, inactive standards are still available, but they are not currently supported by the global technical committee.

Motion: To let M14 and M19 go inactive

By / 2nd: Russ Kremer (Freiberger Compound Materials) / Judy Kronwasser (NOVAsiC)

Discussion: None

Vote: 4-0 in favor. Motion passed.

- M23 and M79 are still current. Judy Kronwasser will review M23 to ensure it is current before it can be sent out for reapproval ballot. M79, Hani Badawi will review as well. Nonetheless, the committee would like to make a conditional motion to send M23 and M79 for reapproval ballots pending review.

Motion: To send M23 and M79 for reapproval pending review

By / 2nd: Russ Kremer (Freiberger Compound Materials) / Judy Kronwasser (NOVAsiC)

Discussion: None

Vote: 4-0 in favor. Motion passed.

Action Item: 2016May #01, Kevin Nguyen to send a copy of SEMI M23 to Judy and M79 to Hani Badawi (AXT) for review.

6.3 NA CSM SNARFs Past Three Year Document Development Period

None

6.4 NA CSM Standards with Nonconforming Titles

None

7 New Business

7.1 New Ballot Submission Summary

The NA CSM TC Chapter authorized submission of the following ballots:



| # | When | SC/TF/WG | Details |
|-----|------------|----------|--|
| tbd | Cycle 1-17 | CSM TC | Line Item Revision to SEMI M10 Terminology for Identification of Structures and Features Seen on Gallium Arsenide Wafers (To address a comment from Murray Bullis on ASTM F47 was discontinued in 1998 and replaced by F1725 which is now a SEMI standard MF1725) |
| tbd | Cycle 1-17 | CSM TC | Reapproval of SEMI M23-0811 Specification for Polished Monocrystalline Indium Phosphide Wafers |
| tbd | Cycle 1-17 | CSM TC | Reapproval of SEMI M79-0211 Specification for Round 100 mm Polished Monocrystalline Germanium Wafers for Solar Cell Applications |

Motion: Approve submission of ballots
By / 2nd: Russ Kremer (Freiberger Compound Materials) / Judy Kronwasser (NOVASiC)
Discussion: None.
Vote: 4-0 in favor. Motion passed.

8 Action Item Review

8.1 Open Action Items

Kevin Nguyen (SEMI) reviewed the open action items. These can be found in the Open Action Items table at the beginning of these minutes.

8.2 New Action Items

Kevin Nguyen (SEMI) reviewed the new action items. These can be found in the New Action Items table at the beginning of these minutes.

9 Adjournment

Having no further business, a motion was made to adjourn the NA Compound Semiconductor Materials Committee meeting on May 18 in conjunction with CS MANTECH 2016. Adjournment was at 8:00 PM.

Respectfully submitted by:

Kevin Nguyen
 Manager, International Standards Operations

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Minutes approved by:

| | |
|--|--|
| Russ Kremer (Freiberger Compound Materials), Cochair | |
| Jim Oliver (Northrop Grumman), Cochair | |



Table 8 Index of Available Attachments #1

| <i>#</i> | <i>Title</i> | <i>#</i> | <i>Title</i> |
|----------|-------------------------------|----------|-----------------------|
| 1 | NA CSM Minutes 2015 CSMANTECH | 5 | 5884_ProceduralReview |
| 2 | ECS Liaison Report May 2016 | 6 | 5885_ProceduralReview |
| 3 | 5882_ProceduralReview | 7 | 5886_ProceduralReview |
| 4 | 5883_ProceduralReview | 8 | SEMI Report May 2016 |

#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 Paul Trio at the contact information above.