



CMC Associates

Nov. '17 Meeting

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November
2017

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Outline

- Introductions
- In the news today – Lita Shon-Roy
- TECHCET Analyst Update: Bruce Adams / Gases– 20 min
- Joint Session Planning
- Future Meeting Schedules & Wrap up – 1 min.

New News

 www.criticalmaterials.org

 CMC Associates quarterly updates and meeting slides: www.techcet.com

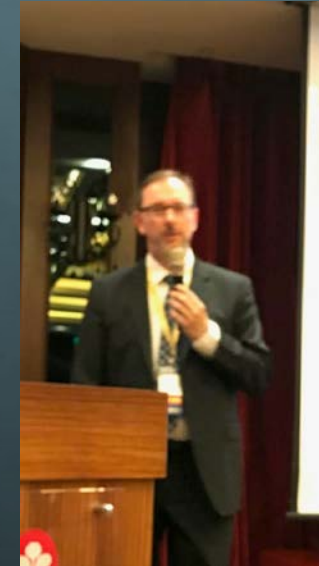
CMC F2F Fall Meeting - Hsinchu



From left to right: M.Walden-TEHCET, A.Carrara-STMicro, T.Sagemueller-Nexperia, J.Neuteboom-NXP, J.P. Garve-GlobalFoundries, J. Peng-TSMC, J.Harris-Cypress, C.C. Ho-TSMC, D.Kong-TEHCET, KH.Ke-TEHCET, J.Freund-Infineon, J.Strupp-TI, R.Han-Saumsung, H.Kim-Samsung, M.Denney-Intel, K.Asahi-TPJazzSemico

Fall 2017 CMC Seminar -Hsinchu

- 🌐 The 1 Day Seminar follows the private F2F. The Seminar is focused on Dynamic Changes in Materials Markets and Supply-Chain: 60 people attended
- 🌐 Speakers are hand selected for their insight on the supply-chain and markets trends relating to semiconductor devices and materials



Two Keynote presentations: Jan-Peter Garve, Head of Materials & Utilities Global Procurement at GlobalFoundries and Anna Carrara, Global Procurement & Outsourcing, FE Materials Sourcing Director of ST Microelectronics.

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CMC Seminar

Presentation Access

-  Go to www.techcet.com
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Electronics Materials Information



TECHCET Critical Materials: Electronic Gases CMC UPDATE

Bruce Adams, Sr. Analyst

November 2017

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Analyst Introduction



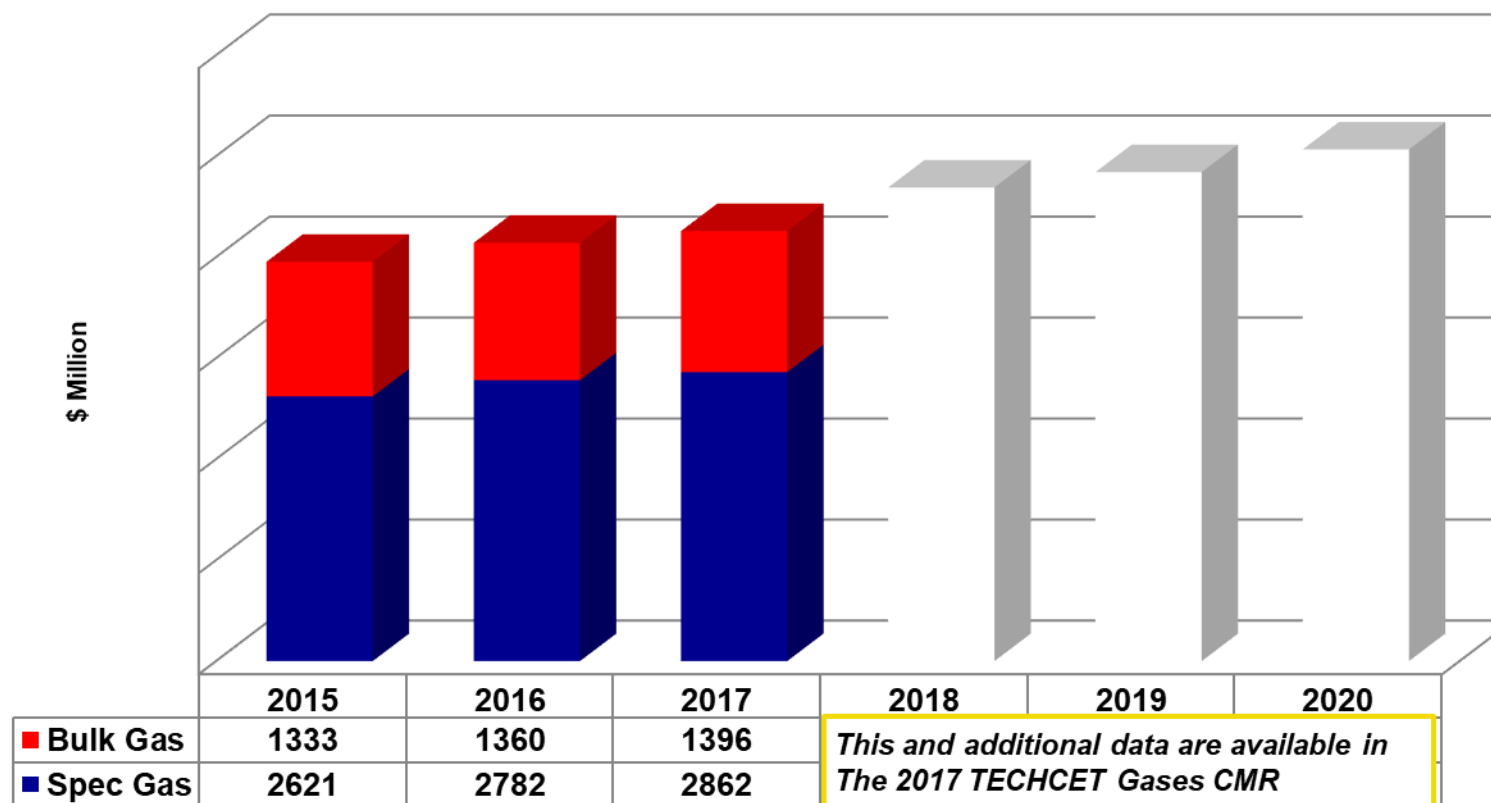
Bruce Adams – Sr. Technology Analyst of TECHCET— covers high purity specialty gases and chemicals used to manufacturer electronic devices. He has over 30 years of experience in the electronics industry, and has held senior positions at Air Products, Matheson, Sumitomo, and Honeywell. He combines both technical and marketing capabilities to understand and analyze the dynamic electronic materials market. He is well versed in international business, having traveled extensively throughout the world and negotiated and helped start a joint venture in Japan. He has served as co-chair of the SEMI Photovoltaic Advisory Committee, SEMI Standards Committees, and several technical symposia. He holds a M.B.A. from Arizona State University, a B.S. in chemistry from Grand Canyon College, and one patent.

Confidential Information

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Electronic Gas Forecast

Electronic Gas TAM Forecast



Gas Forecast Comments

- 🌐 Electronic industry is doing well this year. Expect the gas market numbers to increase for this year and next year
- 🌐 3DNAND driving growth with multiple depositions being required to create 3D structures
- 🌐 Very positive results announced by all gas suppliers for the 3rd quarter, ranging from 3-19% growth YoY

Gas Incidents - 1

- 🌐 July 6 – A Praxair liquified tanker truck caught on fire on I-65 in Mobile County, Alabama. The fire was in the engine block of the rig and no gas release was announced.
- 🌐 September 13 – A roof over the generator building caught fire at the Praxair Burns Harbor facility in Indiana. The fire spread over a 820 x 30 foot area and required fire department dispatch. No injuries were sustained and no gas leaks occurred.

Gas Incidents - 2

- 🌐 October 2017 – An Air Products H₂ tanker driver was cited for crashing into a light pole at a Wegman's parking lot in Niagara County, NY.
- 🌐 Carl D. Wolfe, 63, was cited for not following lane markings in the parking lot and hitting a light pole. He was seen cutting across driving lanes
- 🌐 The incident resulted in an emergency response team being called and evacuations of four homes and closure of nearby businesses. Niagara Intl was also shutdown as a precaution
- 🌐 Leak of some H₂ did occur but no injuries were reported

Qatar Update - 1

- 🌐 The two RasGas plants that were shutdown on June 12th have restarted, effective July 2nd.
- 🌐 Qatar has begun using it's own port in Hamad to transport helium worldwide.
- 🌐 They have developed new shipping routes, minimizing the impact of the blockade
- 🌐 Although the blockade has shrunk Qatar imports by 40% YoY, Helium effects were short term and shipments are resuming
- 🌐 Helium markets have returned to a relative normal in October

Qatar Update - 2

- 🌐 Update from the Qatar Government Communications Office on September 24, 2017:
- 🌐 The siege imposed by some countries on Qatar will have no impact on its overall global trade.
- 🌐 Trade between Qatar and blockade countries only amounts to 6.7% of total global trade
- 🌐 Qatar has not delayed or missed a single shipment since the blockade began
- 🌐 Major trade partners, Japan, South Korea, and India account for \$60B in global trade revenue and this will continue
- 🌐 Qatar has accelerated its plan for economic self sufficiency

Qatar Update - 3

- 🌐 New shipping routes established by Qatar is causing some logistical issues:
- 🌐 Industry container fleet is stretched tight as more containers are required for the longer shipping routes and times
- 🌐 Helium prices may see increases in the near future as gas suppliers need to purchase more containers for their fleet management and shipping costs of private charters being used by Air Liquide and Linde will further add to costs.

Mergers and Acquisitions - 1

- 🌐 Air Products and Linde North America announced the formation of a new joint venture named East Coast Nitrogen
- 🌐 The JV will build a new 1,100 TPD ASU and liquifier in Glenmont, NY and produce LIN, LOX, and LAR
- 🌐 Product will be distributed by both parents to the New York and New England markets.
- 🌐 Approximate investment is \$60MM and targeted completion is December 2018

Mergers and Acquisitions - 2

- 🌐 Showa Denko has established a wholly owned subsidiary named Showa Chemicals of America, Inc. (SCA) in Austin, TX. The operation will start in October with the following goals:
 - 🌐 Further expand its high purity gas business in the US
 - 🌐 Strengthen relationships between SDK and major semiconductor manufacturers in the US
 - 🌐 Gather information about state-of-the-art semiconductor processing technologies
- 🌐 This represents a direct threat to US based gas suppliers as Showa Denko looks to expand its influence (and sales) from Japan and Asia to the US market. TECHCET has been forewarning about Showa Denko's expansion strategies for the past couple of years. This is a major step.

Mergers and Acquisitions - 3

- 🌐 Gelest was acquired by New Mountain Capital, a New York based private equity firm.
- 🌐 New Mountain gains controlling interest in Gelest
- 🌐 Monetary terms were not disclosed
- 🌐 Current Gelest Management will remain in place
- 🌐 New Mountain will pursue expansion strategy and look for potential mergers for Gelest in the next 2-3 years
- 🌐 Gelest produces Electronic grade Germane gas

Dow Dupont Merger Update

- 🌐 DuPont and Dow Chemical confirmed on June 15 that an agreement with the US Department of Justice had been reached, clearing the regulatory approval needed in the US.
- 🌐 Dupont will divest certain parts of its crop protection portfolio
- 🌐 Dow will divest its global ethylene acrylic acid co-polymers and ionomers business
- 🌐 DowDupont received all regulatory approvals as of August and started trading on September 1st under the ticker “DWDP”
- 🌐 Now starts the 18 month journey to dismantle the newly merged company into three entities

Linde and Praxair Merger Update - 1

- 🌐 August 15 marked the start of the 10 week acceptance period for the merger. During this time, which runs through October 24, 2017, both parties will need to gain approval of their shareholders:
- 🌐 Linde will need 75% of its shareholders to tender their stock to the new company
- 🌐 Praxair achieved shareholder approval for the merger at the end of September
- 🌐 Expected closing is 2nd Half of 2018

Linde and Praxair Merger Update - 2

- 🌐 Linde PLC lowered the minimum acceptance ratio to 60% from 75% to go forward with the deal
- 🌐 Linde still requires 75% for full approval but will negotiate with Praxair if they achieve 60% - still may fail
- 🌐 Moved the closing date by 2 weeks to Nov 7th
- 🌐 As of the end of October, they had received 67.9% of Linde shares tendered
- 🌐 Linde has also received full anti-trust approvals from Russia, Pakistan, Paraguay, and Turkey, 4 of the 24 required approvals

Showa Denko Price Increases

- 🌐 Showa Denko announced price increases for its high purity fluorine-based gases for Electronics
- 🌐 FC-116 (C₂F₆) and FC-14 (CF₄) will increase by Yen 500 per Kg (~\$4.5/kg) for shipments effective September 1, 2017
- 🌐 Raw material and energy price increases were the main reasons cited.
- 🌐 You may not obtain these products directly from Showa Denko but your supplier may resell their products to you. Ask your supplier.

SDS and UpTime Competition

- 🌐 Versum Materials and NuMat Technologies announce a global commercial agreement to offer a new line of products for the safe storage and delivery of dopant gases
- 🌐 Product line is called ION-X and is based on a revolutionary Metal Organic Framework (MOF's) which can selectively adsorb, store and deliver ultrahigh purity gases at sub-atmospheric pressures
- 🌐 Will provide competition to both Entegris SDS and Praxair UpTime as well as hydride cylinder business

Thank You!
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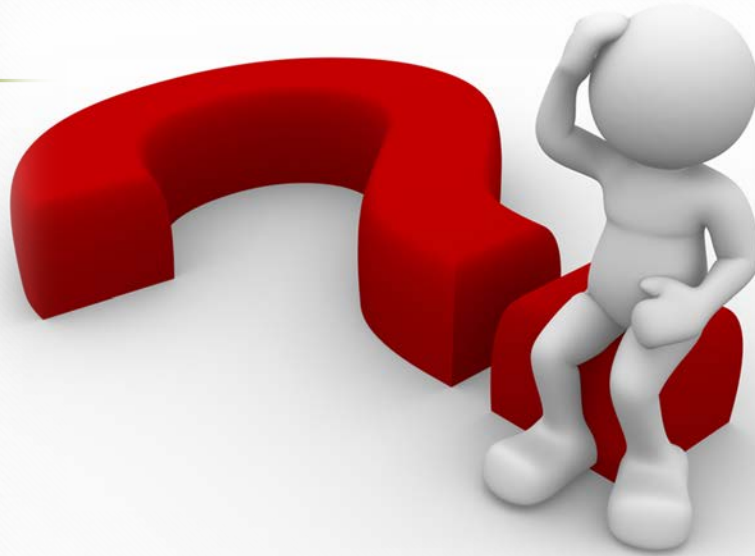
Joint Session Topics

- PCN (product change notification) – how to minimize and/or prevent problems that occur from PCN – automotive industry
 - BCP (Fred McNeil) – very few fabs actually take the time to qualify the second tier supplier relates to PCN
- Ship to control proliferation problems – how to minimize these problems for both sides? Is this just for leading edge materials?
- Impact of geopolitical issues on semiconductor supply chain, with focus on Asia / China

Future Meetings / CMC Conference 2018

- ❑ CMC Monthly – December 13 – Dielectric / Metal Precursors
- ❑ CMC Monthly – January 24 – Silicon Wafers
- ❑ CMC 2018 F2F and Conference– April 24-25 and April 26-27 respectively Phoenix, AZ (Chandler area)
 - ❑ Working on host confirmation now and hope to get confirmation soon
 - ❑ Conference will focus on a blend of business and technology interests
 - ❑ Call for papers has went out – looking for presentations which deal with future materials and practical supply chain concerns addressing the semiconductor industry
- ❑ Please contact edk@Techcet.com for additional conference information

Discussion



Thank you!
