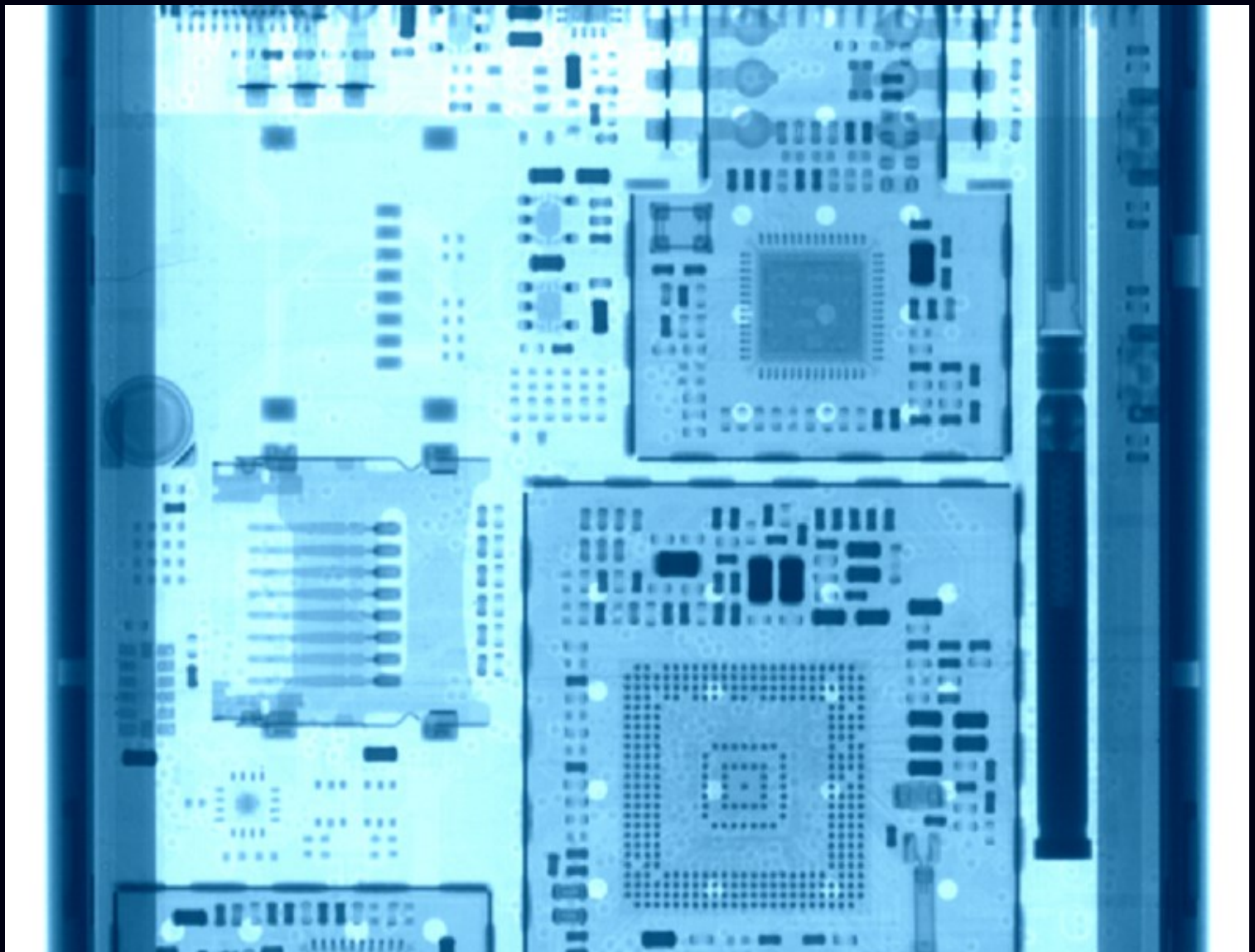


The Crucible

Special Focus: Amsterdam Conference 2016

Supply chain management – Beyond conflict mineral reporting



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WELCOME

Welcome to Gina

We are pleased to welcome Gina Evangelidis as the new MMTA Administrative Assistant. Gina has several years' administrative experience in the music industry and a degree in Creative Writing, and is enjoying learning about the MMTA and its metals.

NEW MEMBER— Holman Fenwick Willan

Holman Fenwick Willan (HFW) is an international law firm with 450 lawyers across the world. We have strength in depth, with nearly 70 lawyers worldwide specialising in commodities, reflecting our long involvement in this field. We advise all those involved in the metals business including producers, traders, stockholders, end users, logistics operators, warehouses, carriers, banks and financial institutions. In addition to our experience in metals, we act across the spectrum of the commodities markets including coal, oil and gas, renewables and softs. Many of our lawyers have direct industry experience, having worked in senior roles within global commodity firms and banks. We are highly recognised as a leading law firm and are ranked as a top tier firm for our commodities work by both Legal 500 and Chambers & Partners. Our dedication to the commodities market is further evidenced through our industry awards including the Commodity Business Award 2014.

Primary Contact: Marc Weisberger

Email: marc.weisberger@hfw.com

Website: www.hfw.com

Phone: +44 (0)207 264 8888



NEW MEMBER— Australian Zirconia

Australian Zirconia Limited (AZL) is a wholly owned subsidiary of the Australian multi commodity mining company, Alkane Resources Ltd (ALK). AZL was formed in 2000 to develop the Dubbo Zirconia Project (DZP) located in the Central West region of New South Wales about 400km northwest of Sydney. The DZP is based upon the very large in-ground resource of zirconium, hafnium, niobium, tantalum, yttrium and rare earths. Over many years AZL has developed a process flowsheet to recover and produce zirconium, hafnium, niobium, yttrium and rare earth products.

Recent feasibility studies have demonstrated a robust technically and financially viable project at current product prices. All government approvals are in place and the project is awaiting financing to proceed to construction. On the current anticipated schedule the DZP should commence commercial production in the second half of 2018 and will be a significant supplier of a number of critical metals.

Primary Contact: Ian Chalmers

Email: ichalmers@alkane.com.au

Website: www.alkane.com.au

Phone: +61 8 9227 5677



INSIDE THIS ISSUE

Amsterdam 2016	4-5
Tulip madness	6
Self-healing metallo ceramics	7
Supply chain management	8-10
Letter from N. America	11
Calcium metal	12
What's in an iPhone 6?	14-15
Fairphone	16
CRM Alliance update	18

The MMTA promotes essential elements that add quality, safety and enjoyment to our lives.

The MMTA is the world's leading minor metals industry organisation.



Contact Us:

Address: MMTA, Suite 53, 3 Whitehall Court, London, SW1A 2EL, UK

Tel: +44 (0)207 833 0237

Email: executive@mmta.co.uk

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THE MMTA'S INTERNATIONAL MINOR METALS CONFERENCE 2016

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Organised by Metal Events Ltd

This year's conference is looking like one of our biggest.

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We are delighted that [C. Steinweg Handelsveem BV](#) is hosting a reception for delegates on board the Het Wapen van Amsterdam on Monday April 18.



**C. Steinweg
Group**



Programme:

KEYNOTE: "Elements of surprise: Metals Murder Think Again (MMTA)" by **John Emsley**, Chemist & Author;
"Current and emerging applications of Se and Te in optoelectronic devices", by **Dan Hewak**, **University of Southampton**, United Kingdom;

Session 1: Wonderful world of minor metals: future movers and shakers:

"The outlook for lithium in batteries", by **Dr Reiner Haus**, Managing Director, **Dorfner Anzaplan GmbH**, Germany;
"The impact of rare earth elements on the performance and application of magnesium based alloys" by **Jim Hickey**, Procurement Manager, **Magnesium Elektron Ltd.**, United Kingdom;
"Hafnium supply: Past, present & future", by **Alister MacDonald**, Consultant, **Alkane Resources Ltd.**, Australia;
"Self-healing in metallo-ceramics and the use of minor metals", by **Professor Sybrand van der Zwatt**, Novel Aerospace Materials Group, Faculty Aerospace Engineering, **TU Delft**, The Netherlands;

Session 2: Interactive session on supply chain management and REACH implementation:

"Are you ready to comply with the REACH 2018 registration deadline?" by **Karine van de Velde**, **REACH Orphan Substances**

The MMTA is currently working on supply chain management issues, and is delighted to offer this interactive session for delegates:

- "Tungsten – conflict free from mine to consumer", by **Steffan Schmidt**, Board Member, **Tungsten Industry – Conflict Mineral Council (TI-CMC)**
- "Cobalt supply chain issues", by **David Weight**, President, **The Cobalt Development Institute**, United Kingdom;
- **Panel discussion**

Session 3: Overview for steel and alloys:

"Alloy steel markets outlook", by **Markus Moll**, Managing Director, **SMR**, Austria;
"Tantalum and niobium myths", by **David Henderson**, President, **Rittenhouse International Resources LLC**, USA;

Session 4: The diagnosis for minor metals post Fanya:

"Expectations for bismuth in a post-Fanya world", by **Sebastian Voigt**, **Hunan Jinwang Bismuth Industrial Co Ltd**, China;
"Selenium in infrared technology", by **Funsho Ojobuoboh**, Consultant, **Vital Materials Co Ltd**, USA;
"Recycling and recovery of minor metals from residues", by **Koen t'Hoen**, Managing Director, **M&R Claushuis**, The Netherlands;
"Indium Market: after the Fanya years", by **Brian O'Neill**, Marketing Manager, **AIM – Minor Metals**, USA;

MMTA's International Minor Metals Conference Attendees

5N Plus Asia Limited	Euromet SA	PGS
5N Plus Belgium S.A.	Euro-Rijn International BV	Plansee SE
5N Plus Inc	Eutectix LLC	Platina Resources Limited
Advanced Alloy Services Ltd	Evans Analytical Group	Platotex Technology Company Ltd
Affilips	Exotech Inc	Powmet Inc
AIM Specialty Materials	FAM International Corp	R. C. Inspection
Alcoa	FIR. Metals & Resources Ltd	REACH Orphan Substances Consortium (ROSC)
Alex Stewart (International) Corporation	Flaurea Chemicals	Resource Capital Funds
Alfred H Knight International Ltd	F.W. Hempel Metallurgical GmbH	Retorte GmbH
Alkane Resources Ltd	GE Aviation	Rheocder Special Metals
Allegheny Technologies	GE Power	Rhenium Alloys Inc
All Metals & Materials Inc	Glencore International AG	RJH Trading Ltd
Amalgamet Canada	GMH Stachow-Metall GmbH	Rio Tinto London Ltd
Amalgamated Metal Corporation	Guizhou Hengzhou Trading Co Ltd	Rittenhouse International Resources LLC
Aminco	Hanwa Co Ltd	Rolls Royce plc
Ampere Alloys	H.C. Starck GmbH	Saatveka Steels & Alloys Pvt Ltd
A&M Minerals	Heraeus Deutschland GmbH & Co KG	SAFT SA
Antwerp Commodity Services	Hickman, Williams & Company	Sargon Holdings Inc
ARCHE	Hudson Metal Corp	Scandinavian Steel
A&R Merchants Inc	Hunan Jinwang Bismuth Industrial Co Ltd	Scandmetal International SA
Areva NP	H.W. Wood Lloyds Insurance Brokers	Select Alloys & Materials Ltd
Argus Media	ICD Alloys & Metals	Siegfried Jacob Metallwerke GmbH & Co KG
Asian Metal	Indium Corp of America	Shaanxi Huadian Resin Co Ltd
ATI	Indium Corp	SMR
Atlantic Metals & Alloys LLC	Innova Recycling	Solar Frontier K.K.
Aurubis AG	International Magnesium Association	Sovereign International Metals & Alloys Inc
Avas Trading Ltd	Jean Goldschmidt International SA	SSP B.V.
Avon Specialty Metals Ltd	Jiangxi Copper Corporation	Strategic Metals Investment Ltd
Beijing Boyu Semiconductor Craftsman Vessel Co Ltd	Jiujiang Jinxin Non-Ferrous Metals Co Ltd	Strategic Minerals Spain
Beijing Jiya Semicondutor Material Company Ltd	Kailida of Changsha High New Tech	Tantalum-Niobium International Study Center (TIC)
BGR	KGHM Polska Miedz S.A.	Telex Metals LLC
BIT Fondel B.V.	Kohsei Co Ltd	Terra Commodities LLC
Boliden Commercial	Lambert Metals International Ltd	Tetronics International
Bomet Holding Inc	Lipmann Walton & Co Ltd	The Chem-Met Co
Bosch	L.S. Nikko Copper Inc	The Cobalt Development Institute
Buss & Buss Spezialmetalle GmbH	Magnesium Elektron	Titan International Inc
China National Nonferrous Metals Imp. & Exp.	Maritime House Ltd	Tophet Corporation
Jiangxi Co Ltd	MBR Metals OU	Tradium GmbH
China Nonferrous Metals Industry Association (CNIA)	Metal Bulletin	Tranzact Inc
CMK- The Gallium Arsenide Company	Metal Do Co Ltd	Traxys Europe SA
Codelco USA Inc	Metalink International Co Ltd	Traxys North America
CRM Alliance ASBL	Metal Partner GmbH	Umicore
Cronimet Central Africa	Metalwerks PMD	Umicore Specialty Material Recycling
Cronimet Ferroleg GmbH	Metalysis Ltd	Umicore Precious Metals & Refining
C. Steinweg (Baltimore) Inc	Metherma KG	University of Southampton
C. Steinweg Belgium N.V.	Miltiverse Mineracão	Vital Materials Co Ltd
C. Steinweg Handelsveem	Minchem Limited	Vollers Netherlands B.V.
Darton Commodities Ltd	Minerals Resources International AG	WEC Specialty Materials
Delft University of Technology	Mitsui & Co. Europe Plc	W.H. Ferer Co LLC
Dorfner Anzaplan	MMTA	William Rowland Limited
EAC Corporation	Molycorp Inc	Wogen Resources Ltd
E&C Trading	Molycorp Silmet	Wolfram Bergbau und Huetten AG
Earth Metals LLC	Molymet	Wolfram CJSC
ELG Utica Alloys Ltd	M&R Claushuis	Womet GmbH
Environmetals LLC	NEC TOKIN Corporation	Zhisheng Mining Limited
ERG Sales Africa AG	Odin Warehousing & Logistics BV	Zhuzhou Keneng New Material Co Ltd
	Pan Pacific Copper Co Ltd	Zhuzhou Smelter Imp. & Exp. Co Ltd
	Penningtons Manches LLP	(Updated 30th March 2016)

Tulip Madness – commodity boom and bust is not a new phenomenon

According to Mike Dash, author of *Tulipomania, The Story of the World's Most Coveted Flower*, "In around 1624, the Amsterdam man who owned the only dozen specimens [of a spectacular midnight blue tulip topped with a band of pure white, and accented with crimson flares] was offered 3,000 guilders for one bulb", a sum he equates with the annual income of a wealthy merchant. Apparently the bulb's owner turned the offer down.

Although the Dutch were not the first to fall for tulips, it was in Holland that this commodity boom and bust took on extraordinary proportions.

In the early 17th century, with lucrative trade via the Dutch East India Company, and resources no longer eaten up by the costly Thirty Years' War, Dutch merchants began to show off their considerable wealth by building huge estates; one of the visible signs of that wealth was to surround their estates by flower gardens.

"It is impossible to comprehend the tulip mania without understanding just how different tulips were from every other flower known to horticulturists in the 17th century," says Dash. "The colors they exhibited were more intense and more concentrated than those of ordinary plants."

Whilst already popular and selling for a high price due to their novelty, after a short time, the tulips became susceptible to a virus called mosaic. It didn't kill the tulip population but created distinct and unique flame-like patterns in vivid colours on the petals.

At this time, traditional bulb buyers were joined in the tulip trade by speculators, who began dealing in tulip bulbs, and speculating on the alterations and uniqueness of the virus' effects. As buyers started to stockpile what they thought would be rare and valuable bulbs, supply became more limited, and demand grew out of control.

Prices were rising so fast and high that even those with quite moderate incomes were mortgaging or trading anything they could liquidate to get their hands on more tulip bulbs, including their land, their homes and their life savings.

"Tulpenwoede" (tulip madness) resulted in big increases in tulip prices. At the beginning of 1637, some tulip contracts reached a level about 20 times the level of three months earlier. A particularly rare tulip, *Semper Augustus*, was priced at around 1,000 guilders in the 1620s. But just before the crash, it was valued at 5,500 guilders per bulb—roughly the cost of a luxurious house in Amsterdam. Then without warning prices collapsed in February 1637. At bulb auctions, suddenly people who had paid ridiculously high prices for their bulbs didn't find anyone foolish or reckless enough to offer even more, and people began to panic, and started trying to sell their bulbs, even at a loss.

Bulb dealers began refusing to honour contracts and people woke up to the fact that they had traded their homes for a flower! A dramatic market crash and panic followed. The government attempted to step in and halt the crash, but the market continued to fall uncontrollably, rendering their efforts useless.

Although some have claimed that the brief period of tulip madness (1634-1637) was an irrational bubble, some economists have pointed to other, far more rational factors. Firstly, an outbreak of bubonic plague in Amsterdam led many to believe each day could be their last, and so they



began to take risks they would not normally have taken. And because gambling was illegal, contracts were unenforceable. If traders misjudged the market, they could just run off without paying.

Another theory is that the tulip market bubble was a response to the anticipated government conversion of futures contracts into options contracts. This change was thought up by government officials, who were also keen to make a quick profit from the tulip trade, although the planned change was cancelled when the market crashed.

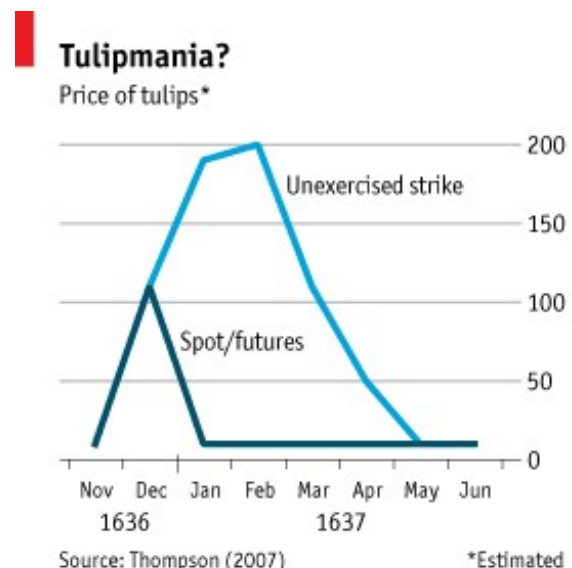


Illustration Source: The Economist Oct 4th 2013

Whatever the reason, within days, the panic had spread across the country. Despite the efforts of traders to prop up demand, the market for tulips evaporated. Flowers that had commanded 5,000 guilders a few weeks before now fetched one-hundredth that amount, and the depression that followed had wide ranging effects, even on those who had thought they had escaped the effects of the bubble bursting by selling in time.

Maria Cox, MMTA

References

Bloomberg Businessweek: When the Tulip Bubble Burst, *TULIPOMANIA, The Story of the World's Most Coveted Flower* By Mike Dash, Crown Publishers
The Economist: *Was tulipmania irrational?* Oct 4th 2013, 14:47 by C.W. & A.J.K.D., London
Market Crashes: The Tulip and Bulb Craze By Andrew Beattie, Investopedia
<http://www.investopedia.com/features/crashes/crashes2.asp#ixzz42agkzmGa>

This year's conference has a line-up of exceptional speakers; below Professor Sybrand van der Zwaag from the Novel Aerospace Materials Group (www.novam.lr.tudelft.nl), at the Faculty of Aerospace Engineering, TU Delft, The Netherlands, gives a preview of his presentation at the conference on 'Self-healing in metallo-ceramics and the development of new metallo-ceramics based on minor elements'.

The aim of the research of the Novel Aerospace Materials Group (NovAM) in Delft is to come up with new material concepts which will give new functionalities, meaning they could be relevant to future aircraft and spacecraft. As the range of materials and functionalities in aircraft and spacecraft is very large, the NovAM group is a truly multi-material group working on many new lines in materials. We focus on four research lines:

- i) the design and synthesis of **new polymers** for high temperature and space applications, robust organic solar cells and membranes,
- ii) the computational design of **new high performance steels and titanium alloys** for landing gear, drive shafts and blades for turbine engines,
- iii) the development of flexible **sensors and actuators** based on topologically structured piezo and pyroelectric ceramics granulates in well chosen polymer matrix and finally;
- iv) the development of **self-healing materials**.

Self-healing materials are capable of healing microscopic cracks spontaneously by a so-called healing reaction. Our self-healing material can be a polymer, a composite, a metal or a ceramic or even a metallo-ceramic. Clearly each material class has its own design and healing strategy.

One of the most interesting self-healing materials we explore are metallo-ceramic MAX phases. Metallo-ceramics are a relatively new form of matter with interesting properties between those of metals and ceramics. More or less by chance we discovered that Ti_3AlC_2 and Ti_2AlC are self-healing when exposed to high temperatures (1000–1200 °C) in air. Cracks which form are filled by special oxides which make the material regain its strength (see the figure to the right). We have done extensive research on the synthesis of these materials via Spark Plasma Sintering, as well as their healing mechanisms and kinetics. In my talk I will show you some interesting results from these experiments.

Recently we became interested in the question of whether other MAX phases with higher melting and use temperatures would also be self healing, and from this we developed a predictive theory. This theory predicts that there are also MAX phases based on minor elements which should be self healing. I will present these predictions at the MMTA Conference, and I hope that we can establish contact with interested delegates to come together for the first trials to make and test such materials, initiating their industrial development.

Professor Sybrand van der Zwaag holds an MSc in metallurgy from the TU Delft and a Phd in applied physics from Cambridge University. He has worked for 10 years in the high performance fibre industry, before returning to the university. Since 1992 he has held the chair Microstructure Control in Metals and since 2004 the chair Novel Aerospace Materials. He has published over 450 journal articles in various fields of materials science. In 2014 he was awarded the title of distinguished professor due to his scientific research on industrially relevant materials and his promotion of better interactions between industry and academia.

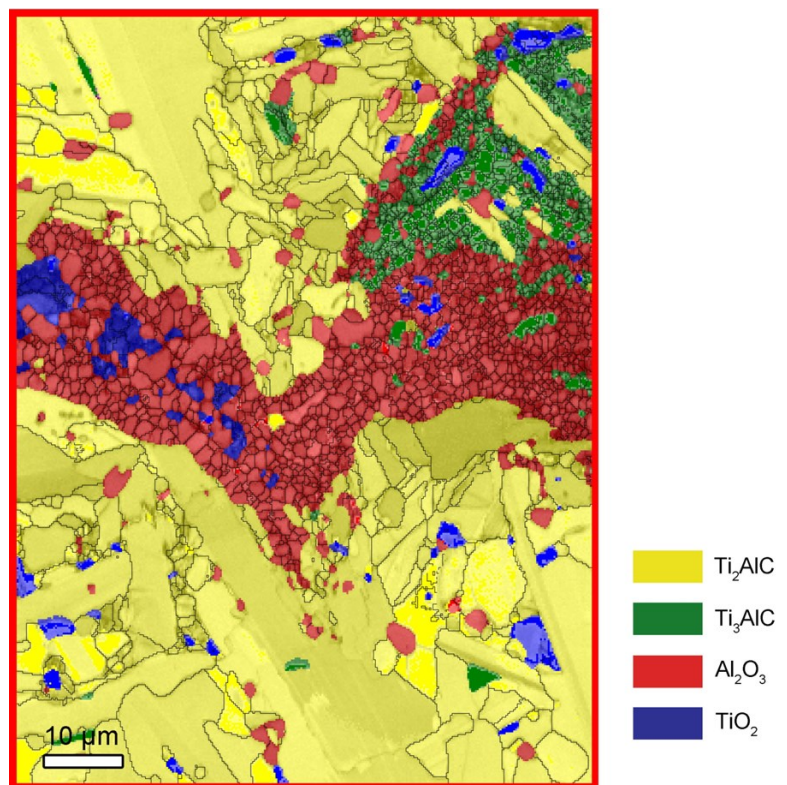


Figure: EBSD measurement of an oxidatively healed crack in Ti_2AlC .

Supply chain management

Beyond conflict mineral reporting

As discussions on the effectiveness of Dodd-Frank continue, the EU's Conflict Minerals Regulation rumble on, and with the recent introduction of the Modern Slavery Act in the UK (see the February 2016 edition of the Crucible for more information), it is easy to understand why companies might simply want the whole topic of supply chain risk management to disappear – it's clear that it's going to take time and cost money, and it's not always possible to see any positives. Nevertheless, understanding and managing supply chain risk in the industry has never been more important. The complex supply chain from mine to end product involves many Members of the MMTA, and one thing is certain, this is a topic that won't go away!

This is an area that the MMTA has been increasingly involved in, and we have organised a discussion at the MMTA International Minor Metals Conference in Amsterdam this April where experts on the subject will discuss how different commodities are approaching this complex issue.

The pressure around responsible sourcing and supply are not only regulatory; consumers and investors are also key drivers in the changes that are affecting the mining and metals industries, so companies must act now to better understand the risks they face as an upstream or downstream supplier.

A key component to making supply chain risk mitigation manageable is having a robust management system that enables risk assessment, strategy development, data management and reporting both internally and externally.

This article looks at some of the key aspects to supply chain management and offers practical solutions to managing and reporting supply chain information.

Sticks and Carrots – Why implement supply chain management?

LEGISLATION

Conflict Minerals Regulation

With the Dodd-Frank Act already in place, the European Parliament is currently seeking agreement on the final version of an EU Conflict Minerals regulation. At the moment, the regulation differs from Dodd-Frank in that it covers not only the Democratic Republic of Congo (DRC), but also includes other regions defined as 'conflict-affected and high-risk areas'. In its present form, the regulation will capture far more organisations than Dodd-Frank, with disclosure requirements affecting both upstream and downstream companies (agreement is still to be reached as to whether disclosure will be voluntary or mandatory).

Given the increasing pressure on the industry to avoid sourcing from conflict-affected regions, it is definitely in a company's best interests to prepare itself now for future legislation. An efficient management system supported by robust due diligence is the best way to do this.

For more information on supply chain management particularly with

respect to conflict minerals read the [*OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*](#).

Modern Slavery Act 2015

As outlined in the February edition of the Crucible, this Act affects all businesses with a turnover of over £36 million and is valid for any organisation which has operations within the UK – meaning many companies based outside of the UK are also affected.

The Act requires impacted organisations to prepare and publish an annual statement detailing the ongoing process they are taking to ensure that there is no modern slavery or human trafficking within their business and supply chains. Without wishing to repeat the steps to be taken (see Crucible February 2016), organisations must prepare and publish either:

- A statement detailing steps the organisation has taken during the financial year to ensure that slavery and human trafficking is not taking place in any part of its own business or supply chains; or
- A statement that the organisation has taken no such steps.

Although option 2 is the simpler journey, having a publicly available statement that effectively says that the organisation does not care about the issue of modern slavery and human trafficking sends a strong message and risks a backlash from stakeholders. As such, the safest route to compliance and brand management is certainly the first.

Again, a robust due diligence process is central to being able to meet the requirements of the Modern Slavery Act. These processes will involve many different aspects including identifying high risk suppliers, gathering and evaluating relevant supplier information, and managing non-compliance, the key will be to have an effective and efficient way to gather and manage the information.

CUSTOMER AND INVESTOR PRESSURE

With a rapidly growing spotlight placed on mining practices and the metals supply chain, more and more customers are seeking to mitigate their own supply chain risks by requesting sourcing information from their suppliers.

This is also true of investors, who are increasingly concerned about the reputational risk attached to issues such as poor labour practices or human rights abuses in the supply chain. Having the right processes in place to evaluate suppliers can not only prevent incidents from occurring but can demonstrate the commitment to responsible business.

SUSTAINABILITY REPORTING REQUIREMENTS

Organisations looking to address sustainability often choose to report their progress through the use of reporting frameworks such as the Global Reporting Initiative (GRI). The GRI G4 guidelines use the concept of addressing an organisation's 'materiality' when defining sustainability aspects to report on.

Assessing areas that are most important or 'material' to an organisation allows them to streamline reporting to focus on key topics which carry the greatest sustainability impacts, risks or opportunities; are of greatest interest to company stakeholders; or carry the greatest regulatory risk.

Often, for producers or users of raw materials, supply chain risk management is included as a material aspect for reporting. For those thinking of starting to report on sustainability, don't forget the MMTA has produced a guide to get you started. This can be found at: <http://www.mmta.co.uk/newsletter/sustainable-minor-metals>

I understand why I'm going to have to do this, but what are the positives for my business?

Let's start with an example of energy saving washing machines. If we go back a few years, there were energy inefficient machines and we were all using them. Then regulation was introduced to force washing machine manufacturers to show how energy efficient their appliances were. Aside from the initial protests about bureaucracy and red tape, this requirement has acted as a stick for those manufacturers not producing energy efficient machines – we can all see who they are because we, as consumers, are now better informed (helped by the visual energy usage system on the front of machines). The change that we are most interested in, however, is that it has allowed manufacturers of the most energy efficient machines to market their appliances in a positive manner, and in many cases to charge more because they are selling higher quality products that will save the consumer money over time.

Now, the metals supply chain is not a washing machine – although there's a lot of metal in them – but how great is it to be able to say to your customers, 'we're a compliant supplier; here's all the paperwork, exactly as you need it, giving you all the information your customers are asking for to reassure them and your investors. We are a responsible supplier'.

In doing so, you can have a marketing message that can be a very powerful one when attracting new business, as well as maintaining current relationships. Not to mention that the companies you sell your product to will really appreciate you making life easier for them in their efforts to comply. There is an advantage to be gained by being an early adopter of such initiatives.

Here is a summary of some of the main reasons a company may choose to report:

- Transparency and reputation
- Customer requests (immediate customer and/or end users/consumers)
- Ethical Behaviour – acting in with 'good values' which may include fairness, equality and diversity
- Supplier requests for information
- Companies can gain valuable feedback from stakeholders so that they may better position themselves in the marketplace
- Attract new business
- Compliance / license to operate (in certain markets)

So how do you make compliance effective without overwhelming your business?

Your organisation may already be collecting supplier information, for example through a spreadsheet or survey, but with the increasing scrutiny placed on third party risk, there are advantages to a single, auditable solution, and there are online products on the market that can certainly help streamline the process and make it more efficient.

Whether online or not, the key aspects that need to be considered are as follows:

- Ensuring all suppliers, wherever they are located, are covered and kept track of
- Easy visibility of which suppliers have complied and the relative risk related to each
- Ensuring you save time and cost associated with collection and management of large quantities of information
- Ensuring your data gathering and reporting capability meet all applicable legislative requirements
- Undertaking detailed analysis to ensure the information you are gathering is meaningful
- Ensuring you consolidate all supplier information requirements in one place and that they are easily accessible

Ensuring you get as high a level of compliance from your suppliers as possible by making the process efficient and user friendly for them. Yours is unlikely to be the only request, for such information, so the easier it is to complete, and the more uniform it is, the more likely you are to get a response.

If you do decide to look for an online solution

There are number of aspects that should be considered when moving your supplier management or due diligence processes online. Software can improve upon current processes, but it is important that it is not treated as a silver bullet in meeting conflict minerals or modern slavery requirements.

Flexibility of content:

It is important that you are not constrained or dictated to by the solution that you select. Over time, your information requirements will undoubtedly alter or expand. It is therefore essential that you use a system that can accommodate this.



Focus on what matters and how to analyse it:

When starting the process of managing supplier risk and compliance, or even when moving from an offline to an online process, the temptation is to ask too much. By attempting to collect vast volumes of data or to obtain detailed information that you don't use, or can't analyse, you are more than likely wasting not only your

own time but also your supplier's time; this can lead to indifference within your organisation and amongst your suppliers.

Use your reporting requirements, or industry and legislative drivers, to inform the questions you ask.

Not all suppliers are the same:

As your organisation becomes more familiar with engaging suppliers, it is likely that you will want to gather different information from different suppliers, or groups of suppliers. With a large supplier network, there is often a need to categorise suppliers and request different information according to geographic location, supplier risk category or the value of spend with the organisation.

Make supplier compliance easy and efficient:

Ultimately it is your suppliers who will have to engage with and complete information through your chosen solution. Bear in mind that suppliers are dealing with multiple requests for information, so any decision taken to lessen the burden on them will be appreciated.

For example, an online solution can enable suppliers to reuse the data that they disclose for other purposes such as sharing it with their other customers, as well as how it can provide a simple single environment for responding to all of your own company's requests for information.

Analytical capability:

When you consider that you may have hundreds or thousands of suppliers resulting in thousands of answers, you need to make sure that your solution has the capability to make use of this data. At the very least you should be able to automatically score responses in a manner that is meaningful to all aspects of your business, flag responses in order to easily identify risk areas, warn of expiring documentation and of course manage your suppliers in an efficient and relevant manner.

Online Supplier Portals

There are a range of web-based platforms for securely sharing information between buyers and suppliers. They should have the functionality to enable a wide variety of qualitative and quantitative information to be gathered from suppliers and analysed, grouped, filtered and scored by buyers.

Key benefits of the platforms for buyers:

- Ability to collect supplier compliance information aligned with frameworks such as GRI G4, UNGC, ISO 14001, ISO 26000; covering anti-bribery and corruption, labour standards and modern slavery, conflict minerals, environment, health and safety and commercial information.
- Information obtained through supplier questionnaires which can be tailored to different suppliers depending on information requirements e.g. by geography or sector
- Proprietary buyer questionnaires ensure coverage of specific information required by suppliers
- Analysis dashboard for analysing, comparing, and benchmarking suppliers

- Registration is free for buyers on the portal, you can then invite your suppliers to join

Key benefits of the platforms for suppliers:

- Enable suppliers to maintain a secure, private and up to date profile of all their non-financial information
- Suppliers can publish information to multiple buyers and invite customers to view their information
- The portals allow suppliers to upload compliance information and certification, along with the ability to record, calculate and report on annual carbon emissions, waste and water consumption

An example of such a portal is Greenstone Supplier Portal:



Dr Sophie Parsons is a Senior Consultant at [Greenstone](#), a non-financial reporting software provider which works with a number of multinational organisations to manage and report on their environmental and social impacts. If you would like more information about the SupplierPortal platform provided by Greenstone, and how it can help manage your supply chain due diligence issues relating to conflict minerals, modern slavery or other areas then get in touch with Gyles, our Head of SupplierPortal, at gscott-hayward@greenstoneplus.com.

Letter from North America

Dear Members

From feet of snow this time in January, I believe that today, Friday, we are going to have temperatures in the low 70s Fahrenheit. We may also have had snow earlier this week, but the daffodils are out, as are the crocuses. And the trees are starting to leaf beautifully in Central Park. New York itself is just chock-a-block with tourists from every nation, here for the holiday weekend.

The seesaw of good news/bad news about Iran seems set to continue.

As many of you may have seen, Iran was in the news again this week with the seesaw of good news/bad news about the country here in the U.S. seemingly set to continue. I wrote in last month's edition of *The Crucible* about the really quite exciting possibilities that may exist in Iran for miners, refiners etc. Now the news is that the U.S. Justice Department is charging seven alleged Iranian hackers with attacking both the U.S. financial system and servers for a dam up in Rye, New York, just northeast of us here in Manhattan. Moreover, in this instance, the hackers are specifically tied to the Iranian government.

The path to normalization in relations between the two countries is obviously going to be very long and, it seems, somewhat arduous, with, as a consequence, more likely than not, shadows being cast on its re-developing relations with other countries.

What's going on in the world of batteries and, more especially lithium?

International geopolitics aside, what's going on in the world of batteries and, more especially lithium? Currently essential for both energy storage systems and electric vehicles, I've been hearing recently that demand is outstripping supply: hardly good news for Tesla and others.

With 85% of supply seemingly in the hands of just four producers, Albemarle (Rockwood), FMC, SQM and Tianqi, and the likes of Luther Kissam, CEO of Albemarle, saying that: "*From a lithium standpoint, we're pretty well sold out*", the question is Whence any new supply? Is it going to be from brines (Argentina etc.) or hard rock – spodumene (Australia)?

In North America, anyway, the search for new supply over the past several years has not been all that propitious. Simbol Material's attempts to extract the metal from geothermal brines by the Salton Sea in California cannot be described as a success. Similarly unsuccessful, RB Energy's (formerly Canada Lithium Corp) attempts to extract it from hard rock at its \$350 million Quebec Lithium mine came to an end when the company filed for insolvency towards the end of 2014.

For companies here in the U.S., it is conflict minerals time again.

For companies here in the U.S., it is conflict minerals time again. Marking the third year of conflict minerals reporting, Form SD filings are due on May 31st. Following the Court of Appeals for the D.C. Circuit's rejection, in November 2015, of petitions from both the SEC and Amnesty International to rehear (again) the *National Association of Manufacturers v. SEC* case, the SEC has, now, no recourse other than to appeal to the U.S. Supreme Court – something that it has not yet done. And, indeed, the deadline for making this filing was, once again, extended, this time from March 9th to April 7th. Who knows what it will do?

Two scientific tidbits from very different parts of the U.S.: From Penn State University came news that its, and U.S. Department of Energy, researchers had found an environmentally friendly and cost-effective way of extracting, through advanced ion exchange methods using ammonium sulfate, rare earth elements from coal. One particularly interesting aspect of their work was that the coal byproducts they used had either been discarded or, because of their poor quality, been consigned to the refuse heap. A way for coal miners to add further value to their activities?

And then there was news from Minnesota that the Natural Resources Research Institute of the University of Minnesota Duluth had, together with a Canadian company, developed proprietary technology that enables them to remove impurities like magnesium oxide from locally-mined ilmenite deposits and "*produce ultra-pure titanium dioxide products that can be directly used as high-value pigments or... feedstock for titanium metal production.*" It will be interesting to see if this technology can be used elsewhere, or whether it is only really of any use in conjunction with locally-sourced ilmenite with specific impurities.

And, on that last scientific note, from a very mild New York, I remain, with very best wishes for the coming spring to MMTA members everywhere.

Tom Butcher, March 28th, 2016

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An introduction to Calcium Metal

A rather neglected element on the Association's Periodic Table, calcium is in fact classed as a minor metal. Say 'calcium' and a metallic substance does not immediately spring to mind, rather a chalky powdery rock or possibly a bottle of milk. Calcium is, however, a metal in its pure form, though rarely seen in this state due to its instability. In air, calcium decomposes rapidly into calcium hydroxide and calcium carbonate. Calcium carbonate is the chalky substance we associate with calcium, with the white cliffs of Dover (see right) being composed of this compound.

Although calcium is the fifth most abundant element (and 3rd most abundant metal) in the earth's crust, present at a level of about 3% in the oceans and soil, it is never found free in nature. Calcium easily forms compounds by reacting with not only air but also with water and acid (on contact with water or acid, hydrogen gas is made in a fairly controlled manner, in comparison to the other alkali metals).

Originally, the scientist Antoine Lavoisier had classified calcium as an 'earth' because it seemed impossible to reduce it further, but he suspected it was the oxide of an unknown element. He was correct, and metallic calcium was first isolated by Sir Humphry Davy in 1808 through the electrolysis of a mixture of lime (CaO) and mercuric oxide (HgO). Today, metallic calcium is obtained by displacing calcium atoms in lime with atoms of aluminium in hot, low-pressure containers.

Due to its high reactivity with common materials, there is very little demand for metallic calcium. One application is in some chemical processes to refine thorium, uranium and zirconium as well as being used to remove oxygen, sulphur and carbon from certain alloys. Calcium can be alloyed with aluminium, beryllium, copper, lead and magnesium and is also used in vacuum tubes as a 'getter', a material that combines with and removes trace gases from these tubes.

However, calcium compounds are widely used. There are vast deposits of limestone (calcium carbonate) used directly as a building stone and indirectly for cement. When limestone is heated in kilns it gives off carbon dioxide gas leaving behind quicklime (calcium oxide). This reacts vigorously with water to give slaked lime (calcium hydroxide). Slaked lime is used to make cement, as a soil conditioner and in water treatment to reduce acidity, as well as in the chemicals industry. It is also used in steel making to remove impurities from the molten iron ore. When mixed with sand, slaked lime takes up carbon dioxide from the air and hardens as lime plaster.

Calcium carbonate is also used to make white paint, cleaning powder, toothpaste and stomach antacids. Gypsum (calcium sulphate) is used by builders as plaster and by nurses for setting bones, i.e. 'plaster of Paris'.

Calcium is essential to all living things, particularly for the growth of healthy teeth and bones. Calcium phosphate is the main component of bone. The average human contains about 1 kilogram of calcium. Children and pregnant women are encouraged to eat foods rich in calcium, such as dairy products, leafy green vegetables, fish, nuts and seeds.

While calcium and its compounds are not considered to be toxic, ingesting too many calcium carbonate dietary supplements or antacids can cause milk-alkali syndrome, which is associated with hypercalcemia sometimes leading to fatal renal failure. Excessive consumption would be in the order of 10 g calcium carbonate per day, though symptoms have been reported upon ingesting as little as 2.5 g calcium carbonate daily.

With thanks to **Karolina Jackiewicz**, Lipmann Walton & Co



The white cliffs of Dover are made of calcium carbonate

Calcium Key Facts

Atomic Number: 20

Atomic Weight: 40.078

Melting Point: 1115 K (842°C or 1548°F)

Boiling Point: 1757 K (1484°C or 2703°F)

Phase at Room Temperature: Solid

Element Classification: Metal

Period Number: 4

Group Number: 2

Group Name: Alkaline Earth Metal

Further reading

<http://www.rsc.org/periodic-table/element/20/calcium>

Nature's Building Blocks: An A-Z Guide to the Elements, John Emsley, 2001, Oxford University Press

Will REACH be usurped as the World's chemical management model?

The American Chemistry Council (ACC) wants to work with its Canadian counterparts to promote a "North American model" of regulation to other countries considering enhancing their chemicals management systems.

Speaking at the GlobalChem industry conference in Washington, DC recently, ACC president and CEO Cal Dooley said if the TSCA (Toxic Substances Control Act) modernisation bill is passed and implemented, it would be a "gold standard internationally". One, he added, that countries like Brazil, India, China and Taiwan should be encouraged to adopt.

Mr Dooley told delegates he hopes the bill – which he "cautiously expects" will be passed by Memorial Day (30 May) – will introduce a more efficient and less bureaucratic approach, while still meeting environmental, health and safety needs and leading to greater innovation.

He went on to describe the EU REACH system as "a good effort", adding that the US has the benefit of learning from its "inefficiencies".

But Mr Dooley's prepared remarks, published by ACC beforehand, were more critical of REACH. These described it as something "which many agree has failed in more ways than it has succeeded. Fortunately, we have taken the lessons learned from REACH and have made sure we do not repeat its mistakes."

Commenting on Mr Dooley's remarks, Echa's Cooperation Director Andreas Herdina said he hoped the US could draw "valuable conclusions from our experience".

Assuming the TSCA reform law is passed, Mr Dooley told his audience, industry must make sure that it is implemented in "a way that meets our primary objective: that we have a chemicals management system in the US that will be the gold standard internationally." At the moment countries such as the Republic of Korea have adopted a "REACH" like system of chemicals management.

To achieve this, he said companies will need to commit to provide the information and data that the EPA (Environmental Protection Agency) needs to make safety determinations. For its part, he said the agency should only ask for the information it needs.

Mr Dooley also said it is important to capitalise on advances in risk assessment to do a better job of evaluating chemical safety. This includes:

- using weight-of-evidence approaches;
- incorporating exposure and threshold models; and
- investigating modes of action.

The EPA's assessment work, he said, should focus on priority chemicals that are in commerce – noting that Canada had addressed around 4,000 substances in its chemicals management plan. The fact that there are 85,000 chemicals listed on the TSCA inventory continues to frustrate industry, he said, because it believes the actual number in commerce is far lower, and ACC hopes the EPA will "reset" it.

Adapted from 'Chemical Watch', 24th March 2016

<https://chemicalwatch.com/>

MMTA & Holman Fenwick Willan Breakfast Seminar

26th May—8:30-10:30am

We are very pleased to announce that the international law firm Holman Fenwick Willan is holding a breakfast seminar in partnership with the MMTA for Members and Associates.

This event is free of charge.

Draft programme:

Session 1: **Counterparty Insolvency**

Session 2: **Warehouse Fraud**

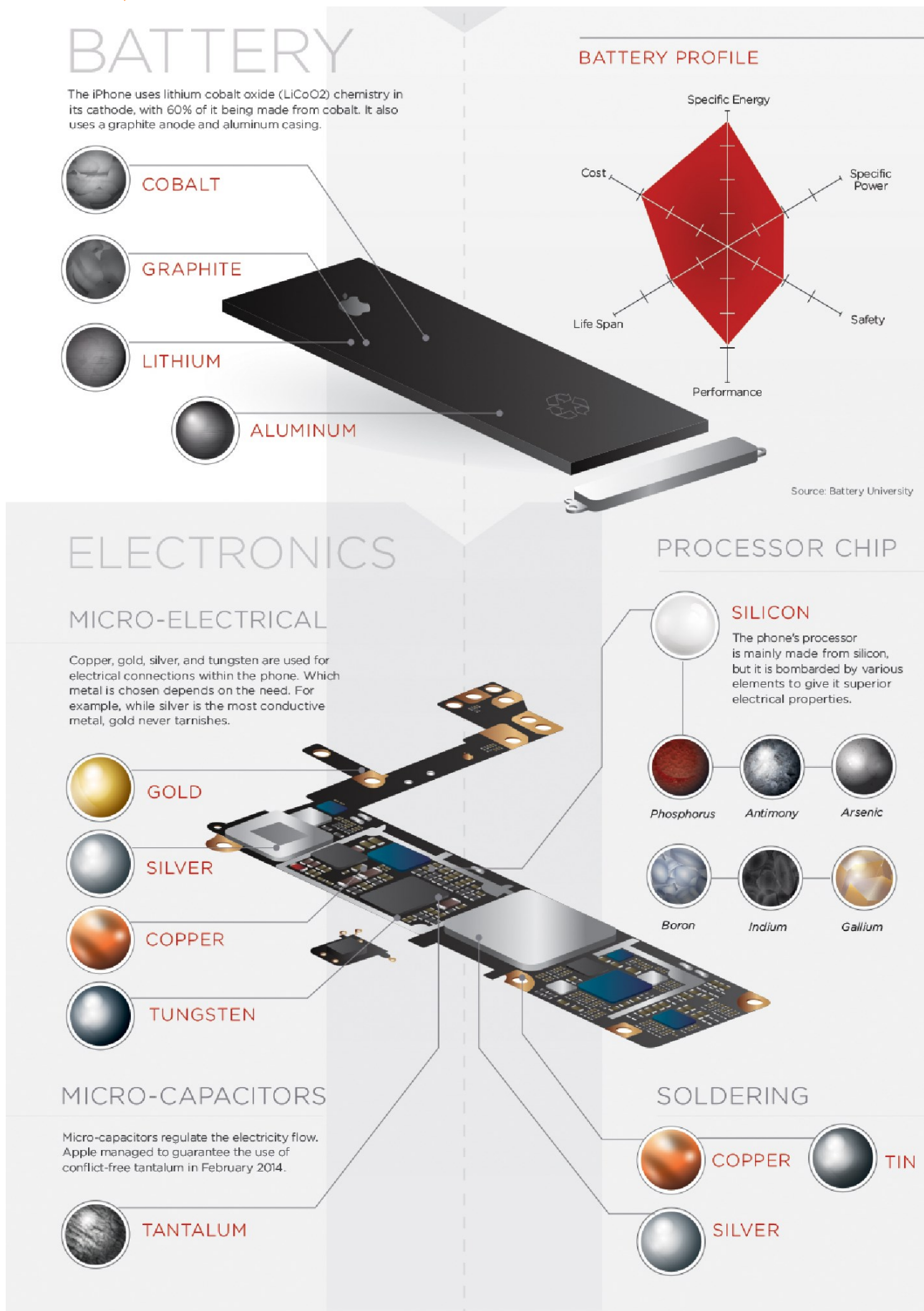
Q & A and networking

To register for this event please contact admin@mmta.co.uk

holman
fenwick
willan **hfw**

What's inside an iPhone 6?

Visual Capitalist produces some fantastic infographics, and they kindly gave the Crucible permission to reproduce them. The image below shows 'What's inside an iPhone 6' and as you can see minor metals are well represented. For more illuminating infographics go to <http://www.visualcapitalist.com/>





Interactive History of Metallurgy Launched

Bodycote, UK, launched an "Interactive History of Metallurgy," a timeline of 10,000 years of metal processing, heat treatment, and surface technology. Containing over 200 high quality images and numerous videos, the interactive infographic pays homage to metallurgy's Neolithic artisans as well as the scientific innovators of the 20th century and a multitude in between. Starting in 8700 B.C. with the world's oldest known copper artefacts, the colour-coded timeline lets users follow the story of that metal over time. Pathways for bronze, iron, and steel are added as they come into play through the ages.

The resource was developed to explore the evolution of metallurgy and heat treating and to acknowledge the collective work of scientists and engineers who have enhanced the properties of metals and alloys throughout human history.

bodycote.com/history-of-metal/



Self regenerating robots

Researchers at Cornell University have created a composite material that could pave the way for a new, flexible, regenerative robot. By creating an open-cell network of pores in silicone, they were able to successfully impregnate it with an alloy of bismuth, tin and indium, which becomes a liquid when heated above 62.2°C. This combination has enabled the material to deform when heated and reform – or 'regenerate' – when cooled.

Rob Shepherd, professor of engineering and leader of the research study at Cornell University, said, 'It's sort of like us – we have a skeleton, plus soft muscles and skin. Unfortunately, that skeleton limits our ability to change shape – unlike an octopus, which does not have a skeleton...That's what this idea is about, to have a skeleton when you need it, melt it away when you don't, and then reform it.'



Of course this material could be applied to a range of technologies, such as aircraft, but it still remains that in the future we may be able to develop robots that can morph shape, dependent on the task at hand.

Gina Evangelidis, MMTA

Fairphone 2: doing things differently

Continuing with the mobile phone theme, and after the previous pages' infographics on the raw materials found in mobile devices, it is pertinent to talk about the variety and complexity of these components and their supply chains. Sustainable and ethical business models alongside consumer behaviour change should be the Tech industry's ambition.

The company behind Fairphone has taken this ideal and created a unique product. This Dutch start-up has been in operation in some form or another since 2010, and this new phone follows up on the first Fairphone, which had a production run of 60,000 devices. They describe their business as a 'social enterprise that is building a movement for fairer electronics'.

Fairphone promotes supply chain transparency with all its major suppliers publicly listed on its website (Including AVX –who spoke at the MMTA's 2015 Toronto Conference on conflict-free tantalum). In addition to raw material issues, the company also want to change the relationship the consumer has with their device. We seem to have reached a point where changing phone every year or two has become the norm, both due to the desire to have the latest model and the rapidly dwindling speed and battery life on older devices. Fairphone, in contrast, has made its mobile completely self-repairable (all you need is a Philips screwdriver) with replaceable components, and new batteries for sale. Fairphone says its phones are designed with a 5-year lifespan in mind.



A real life Fairphone owner I met in Brussels demonstrating the easy to open case and replaceable components

Responsible E-waste Recycling

Fairphone has made various partnerships with organisations such as 'Closing the Loop' to help provide solutions for e-waste in countries without a formal electronics recycling sector. Starting with an e-waste awareness campaign in Ghana, the company collected 75,000 discarded phones there to ship to Belgium for safe recycling. Fairphone's aim is to grow the world supply and demand of recycled materials, on one hand, by increasing recycling, and on the other, by encouraging suppliers to buy recycled materials. For example, the printed circuit board for Fairphone 2 is made from recycled copper. Although laudable, I wonder how unusual the use of recycled copper is? One of the inherent qualities of metal is its recyclability and value on the secondary market. The use of recycled metal is important but a better indicator of sustainability would be "how much of the metal is then recycled back in to a new phone at its end of life?"

The public are also encouraged to donate their old phones by sending it in to be safely recycled or reused, to ensure it stays out of the landfill. Broken phones are recycled, while usable phones get another life on the second-hand market. Again, there are many schemes that offer cash incentives for old phones, a better area to focus on would be changing consumer behaviour by encouraging the retrieval of very old phones that were chunked in the drawer for posterity years ago!

To align with the current push towards the Circular Economy, Fairphone is also exploring alternatives to the current linear economic model. This has been done by researching new business models for service and ownership, including ways to extend the life of the Fairphone, as well as reusing and recycling components and materials from phones that have reached their end-of-life.

The Fairphone costs €525 (around £395/US\$570/AU\$805), so not a low cost option. Unfortunately due to its small production runs Fairphone is yet to benefit from the economies of scale. It's 5-year lifespan does, however, make up for the initial outlay. There will also be no penalties or software crashes for phones fixed by independent retailers! One great feature of the Fairphone 2 is the two SIM slots for home and abroad.

Fairphone has taken on the big phone makers with a phone that is an antidote for the opaqueness and waste in the supply chain of other available devices. Although not perfect, their efforts should be commended, especially the attention their message draws to the behaviour of others in the phone industry.

Tamara Alliot, MMTA

References

<http://www.wired.com/2016/02/review-fairphone-2/>

<https://www.fairphone.com/>

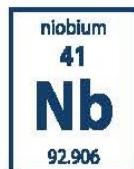


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CRM Alliance Update

The Critical Raw Materials Alliance recently held its bi-annual meeting in Brussels. The Alliance met with the consultants [TNO](#), who are tasked with completing the new CRM list for 2017.

The raw materials to be assessed for this new list have been divided as follows: abiotic materials, platinum group metals, rare earths, additional abiotic materials, other biotic materials, specialist and rare wood species, and additional non-energy materials. It is important to note that rare earth and platinum group elements will be assessed on an individual basis, in contrast to the current list in which these elements are grouped together.

KEY POINTS

- The consultants are exploring what would happen if the 'criticality' bottleneck is placed across the first two stages of the value chain i.e. from the extraction phase to the smelter
- Substitution will be used in the methodology in the following areas: in economic risk, import reliance, by-products, and price levels. It will also look at substitution from the perspective of the raw material itself, rather than the application of that material.
- Import reliance is part of the methodology on wholesale activities.
- Trade barriers, such as export restrictions and those barriers defined by the OECD, will be used in the methodology to help determine the criticality of a particular material.
- The EU Commission's Joint Research Center (JRC) will not alter its current methodology (used for the previous lists) unless it is shown that the methodology is significantly misguided. There is a strong desire to have old and new lists 'comparable'.
- Therefore, the main structure of the previous CRM study i.e. supply risk and economic importance will remain.
- Factsheets per material will be published late 2016/early 2017. They will include a forward-looking element, such as the future supply and demand of a particular CRM. The list itself will remain a 'snapshot in time' to be reviewed and updated at regular intervals into the future.
- The first interim report to be published in June at the meeting of the ad-hoc working group.

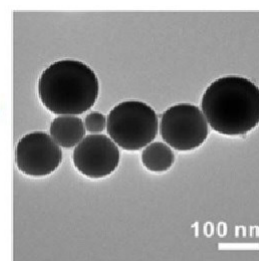
Metal Nanodroplets Seek and Destroy Cancer

Researchers at North Carolina State University, Raleigh, and the University of North Carolina at Chapel Hill have developed a new drug delivery technique using biodegradable liquid metal nanodroplets to target cancer cells. According to Zhen Gu, assistant professor in the joint biomedical engineering program, "The advance here is that we have a drug delivery technique that may enhance the effectiveness of the drugs being delivered, can help doctors locate tumours, can be produced in bulk, and appears to be wholly biodegradable with very low toxicity."

In this technique, 100-nm-diameter droplets of a liquid gallium-indium alloy are introduced into the bloodstream. One type of polymeric ligand binds the anticancer drug doxorubicin (Dox) to the droplets' surface while a second type seeks out cancer cells and causes them to absorb the nanodroplets.

Inside the cells, higher acidity levels dissolve the nanodroplets' oxidized skin, releasing the Dox along with gallium ions that enhance the drug's performance. Without the oxidized skin, the nanodroplets fuse into larger drops that can be detected with diagnostic techniques, aiding in tumour detection. Because the metal degrades in this process, toxicity is minimized.

Right, a schematic illustration of liquid-metal nano-terminators. Red spheres are Dox. Far right, a representative TEM image of liquid-metal nano-terminators. Courtesy of Yue Lu.



Reference: <http://www.in-pharmatechnologist.com/Drug-Delivery/Liquid-metal-nano-terminators-enhance-drug-effectiveness>

3D Printed Titanium Hip Replacement

A U.S company has introduced its first 3D-printed titanium hip implant, the new Redapt revision acetabular fully porous cup with Conceloc technology. To support bone growth, the 3D manufacturing process will be used to produce an entirely porous implant, one that mimics the structure of cancellous bone, better suited to the structure of the body.

The company noted that the Conceloc advanced porous titanium technology is an alternative to external porous coatings, such as sintered beads or fiber mesh, used in other uncemented implants. The new Redapt cup has been developed for use in revision cases where compromised bone makes implant fixation and stability more difficult.



"Bringing to market a 3D-printed titanium acetabular cup for difficult revision procedures is just one example of the potential of this remarkable technology," says the company's global reconstruction vice-president Mike Donoghue.

Redapt variable-angle locking screws, as well as traditional non-locking screws, work within the implant's geometry to provide both compression and a rigid construct to the acetabular shell. The 3D-printed titanium hip implants are available at selected sites in the United States.

For more information visit:

www.smith-nephew.com

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