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The Crucible

Yale University Criticality Consortium

Conflict Minerals – The Politics of Compromise

The magazine of the Minor Metals Trade Association

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INSIDE THIS ISSUE

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.

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Welcome from James Peer, Maritime House Ltd, and new MMTA Chairman

I was delighted to have the opportunity to put my name forward to be the next Chairman of the MMTA. For those who don't know me, let me briefly introduce myself and our company. I am a Director and Shareholder of Maritime House Ltd, our family business. Maritime House Ltd is a major supplier of nickel based superalloys into the Former Soviet Union. Our company also owns and operates a rhenium recycling plant in Canada.

Prior to joining Maritime House in 2008, I spent 10 years in the tobacco trading business in Asia, obtained an MBA from Cranfield School of Management followed by 3 years as a Purchasing Director in Johnson & Johnson's Consumer Division in Switzerland.

Maritime House Ltd has been a Member of the MMTA since 2007, and I have been on the Board serving as both Treasurer and Business & Social Events Committee Chairman since 2012.

Our company has benefited greatly from what I consider to be the three great strengths of the MMTA:

- A robust Membership approval process which means that when you want to do business with a Member of the MMTA you know that the Member in question has the peer approval of the rest of the Membership. Our warehouse rules, arbitration facilities and metal norms help enable Members to conduct business in a fair and straightforward manner.
- The gathering and sharing of information relevant to our Members – this is done through our vastly improved website, the Crucible, through direct mails to our Members and a number of regularly held training events.
- The networking events put on by the Association—these regularly held events throughout the year in both Europe and North America allow our Members a platform to meet up, talk and do business. The flagship event is, of course, the MMTA's International Minor Metals Conference organised in partnership with Metal Events Ltd.

My goal over the next 3 years, with the support of the Board, is to build on these 3 strengths and in particular focus on an improved information gathering and sharing service.

In addition, I feel that with the Asian region being such an important consumer and producer of the metals we cover, it is critical that we create better links with this region. This will be an area of focus for the Board.

My overriding vision for the MMTA over the coming 3 years however is one of " if it ain't broke, don't fix it" – continuity, stability and building on the work of the Association under Roy Walton's outstanding leadership over the past 3 years will be the goal under my Chairmanship.

As a final point I would say that I would not have considered standing for the position if it wasn't for the strength of the Board we have, not least the support I know I can rely on from Simon Boon as Vice-Chair, and of course our outstanding General Manager, Maria Cox. I thank them now in advance for trying to help make me look good over the next few years!

Thank you.

James Peer, Maritime House Ltd

MMTA Chairman

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The MMTA's International Minor Metals Conference

Toronto 2015

Members and non-members of the MMTA joined a great line-up of speakers in Toronto last month for the MMTA's International Minor Metals Conference. A vibrant and rapidly growing city, Toronto was the perfect location to hear about the future demand of minor metals in the aerospace, electronics, battery and alloy industries.

Bill Bihlman of Aerolytics LLC opened the event with his presentation on 'Aerospace material and manufacturing evolution'. Bill looked at some of the engineering considerations for material selection in aerospace, and predicted that future demand for titanium would remain strong. United Technologies Corporation continued the aero theme with a look at engines. Steve Ciccalone estimated that 62,000 more engines will be required by the aerospace industry over the next 20 years, with nickel alloy and titanium alloy demand to grow extensively over the next 7 years.

Titanium was also cited by Alcoa's Boyd Mueller, VP Research & Technology, as the fastest growing aerospace material, he highlighted that geo-political risks are the greatest potential threat to future titanium supply.

5N Plus, First Solar and Tri-Star Resources focused on electronics and new technologies in the second session. Michael Benson from 5N Plus outlined how new applications will impact the demand for electronic metals. The photovoltaic, tellurium and LED markets were illustrated, wrapping up with a look at the trend of miniaturisation and the particle size required for use in micro solders and pastes.

Jigish Trivedi, VP Technology Integration at First Solar, began with a visual comparison of the abundance of solar energy in comparison to other renewable resources. He stated that cadmium telluride (CdTe) has the lowest carbon footprint of all solar technologies and has greatly improved its manufacturing processes in recent years.

Emin Eyi of Tri-Star Resources touched upon critical raw material status and its effect on R&D from the perspective of an antimony producer, as well as the growth in antimony and its connection to gold and other precious metals. Emin finished with the information that the USGS is tasked to identify and quantify critical mineral resources throughout the US within 4 years.

Malcolm Harrower from Indium Corp talked about how indium production outside China had increased by about 15% over the past 3 years. Reinforcing the First Solar presentation, Indium Corp stated that that solar energy is now a genuinely competitive source of energy which includes indium in the form of CIGS (copper indium gallium selenide) cells. Personal electronic devices are a big user of indium with indium gallium zinc oxide (IGZO) developed by Sharp now used in many smartphones and tablets enabling very high-pixel-per-inch counts. Malcolm also spoke about the Fanya Exchange and the reported 3600 tons of indium stocked there which equates to 7 years supply. The effect of this stock on the market is of concern to the indium industry.

CNIA's (China Non-ferrous Metals Industry Association) Tang Wujun talked about China's indium, bismuth and germanium industry with some interesting insights into the production and usage of these materials, including the development and outlook of China's indium, bismuth and germanium market, as well as the policies related to these materials.

The presentations and business meetings were complemented by social events, with a particular highlight being the Hockey Hall of Fame, where delegates enjoyed the ice hockey museum and interactive games as well as drinks and hockey themed canapés.

The second day opened with the topical subject of batteries. Jon Hkyawy, President and Director of Canada-based consultancy, Stormcrow, gave the audience a detailed overview of lithium batteries with even conservative forecasts for lithium batteries

predicting we will be using 160,985 MWh by 2025 (Avicenne). Current demand for lithium remains strong and is one of the few materials to have a strong price curve even through the global recession.

Anthony and Suzannah Lipmann gave an entertaining and informative presentation on rhenium and hafnium, both small but nevertheless important markets. Hafnium has a myriad of uses, with the superalloy industry its biggest destination. The presentation included a look at historical prices from Lipmann's own data, as well as how the rhenium market was saved by recycling.

AVX Corporation closed the presentations with Bill Millman looking at tantalum capacitors, the secret to the small, powerful computing devices we now take for granted. Bill talked in depth about the responsible sourcing of tantalum and how the company works directly with mines in the DRC to guarantee 'conflict-free' material without abandoning the region. This system is known as the AVX Closed Pipe model.

The MMTA and Metal Events would like to thank the sponsors of the conference, in particular 5N Plus for their sponsorship of the drinks reception at the Hockey Hall of Fame, as well as the speakers and attendees for making it both an educational and highly enjoyable event.

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DATES FOR THE DIARY

China's Next Five Years
including Networking Drinks
18th June
HSBC, New York, USA
Book This Event

NY Informal Drinks
18th June
Park Avenue Tavern, New York, USA

Wogen vs MMTA Cricket
15th July, London, UK
Register your interest

Critical Raw Materials & Your Business
Followed by Networking Drinks
16th September,
German Aerospace Center, Institute of Vehicle Concepts, Stuttgart, Germany
Book This Event

MMTA'S 42nd Anniversary Dinner
13th October
InterContinental, London, UK
Register your interest
SPONSOR THIS EVENT

New York SEMINAR – China's next 5 years *The country's evolving economy, regulations and evolving minor metal supply chains - With views from those who trade, those who use and the experts who know the country best.*

Thursday June 18th, HSBC, 5th Avenue, New York—followed by networking drinks

Programme

1:00	Lunch
2:00	Overview: China's resource role
2:10	Presentation: Making sense of President Xi's policy changes and economy
2:30	Presentation: Understanding metal trading trends and how government regulations are playing outside of Beijing
2:50	Presentation: Understanding risk in supply and other sourcing concerns
3:30	Panel/Dialogue: China's resource demands: the deeper implications
4:15	Roundtable: How should traders, investors and end-users react to an evolving China?
5:10	Networking drinks reception

Speakers:

William H. Hess, Co-CEO, PRC Macro, **Daniel Rosen**, Partner, Rhodium Group, **David S. Abraham**, Director, Technology, Rare and Electronic Materials Center and Author, *The Elements of Power*, **Noah Lehrman**, Senior Vice President Hudson Metal & Alloys, MMTA, **Clint Cox**, President, The Anchor House,

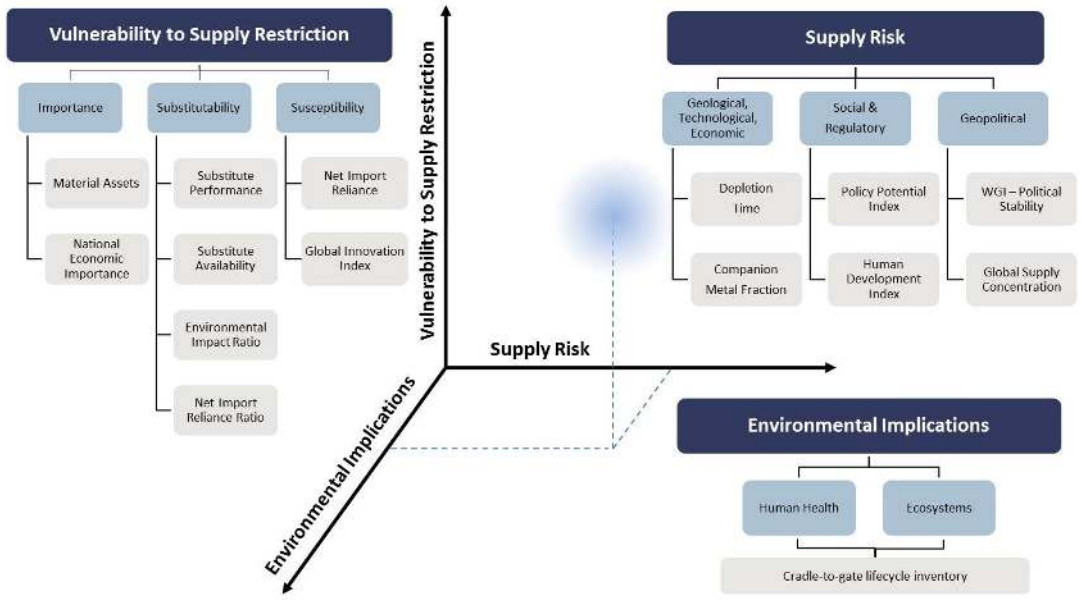
Contact the MMTA Executive Team for more details or book on the MMTA website.

Yale University Criticality Consortium – Spring Meeting 2015

As I mentioned in my last "Letter from North America", Thomas Graedel, Professor of Industrial Ecology at Yale University's School of Forestry & Environmental Studies (and the guest speaker at the 2010 MMTA winter dinner here in New York), very kindly invited me to the spring meeting of the Yale Criticality Consortium (the Consortium) up in New Haven in the middle of March.

Together with the National Science Foundation, the Consortium helps fund the Criticality of Metals and Metalloids project at the school's Center for Industrial Ecology. The research group has just completed the assessment of the contemporary (2008) criticality for 62 elements, comprising the metals of the periodic table plus metalloids and some other elements. The methodology created to quantify the degree of criticality, Professor Graedel's brainchild, comprises three dimensions – supply risk, environmental implications and vulnerability to supply restriction. This provides a structural, and robust, approach that "*reflects the multifaceted factors influencing the availability of metals in the 21st century.*"

National Level Methodology



Source: Yale University, School of Forestry & Environmental Studies, Center for Industrial Ecology

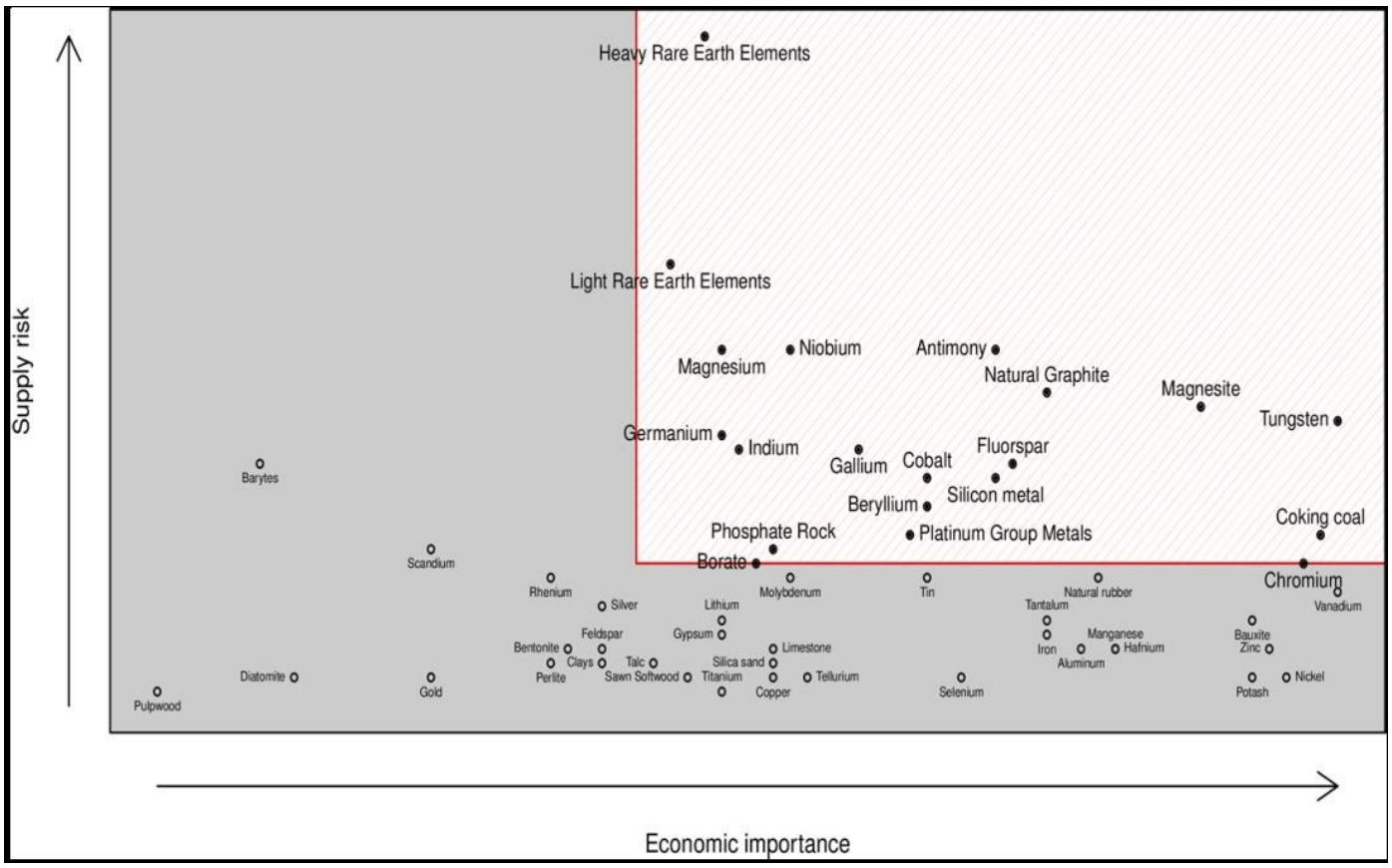
The presentations from Professor Graedel, his research staff and guest speakers, given over a day and a half, were all fascinating. Whilst, unfortunately, I am unable to write about some, either because the academic papers relating to them have still to be published, or because the research involved is only in its infancy, I believe I can provide at least a flavor of some of what was discussed.

Brief observations from two presentations, given by guest speakers, may be of particular interest to association members living in Europe. The first, entitled *Critical Raw Materials: the European perspective* was given by Carlo Pettinelli, Director Sustainable Growth and EU 2020, at the EC Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. This was followed by a second given by Gian Andrea Blengini, Senior Researcher, Sustainability Assessment (H.08), Joint Research Centre, Institute for Environment and Sustainability. Mr Pettinelli was the politician. Dr Blengini was the scientist.

Building his talk on the three pillars of the European Raw Materials Initiative – **sustainable supply of raw materials from global markets**, **sustainable supply within the EU** and **resource efficiency and recycling** – Mr Pettinelli was keen to emphasize that the EU has now moved from a static to a dynamic approach to raw materials criticality.

Rather than a three dimensional, Yale-type approach, the EU's is a simpler, two dimensional, approach, the axes being Economic Importance, i.e. the importance of a raw material per economic sector and the importance of the sector in the EU economy. And Supply Risk, i.e. political and economic stability, level of production concentration, potential for substitution and recycling rates. The EU's first effort at drawing up a critical raw materials list was published in 2010. The process is now being repeated every three years, and the results of the assessment undertaken in 2013 were published in May 2014.

Latest EC Critical Raw Materials Matrix (May 2014)



Source: European Commission: *Report on Critical Raw Materials For the EU, Report of the Ad hoc Working Group on defining critical raw materials*, May 2014

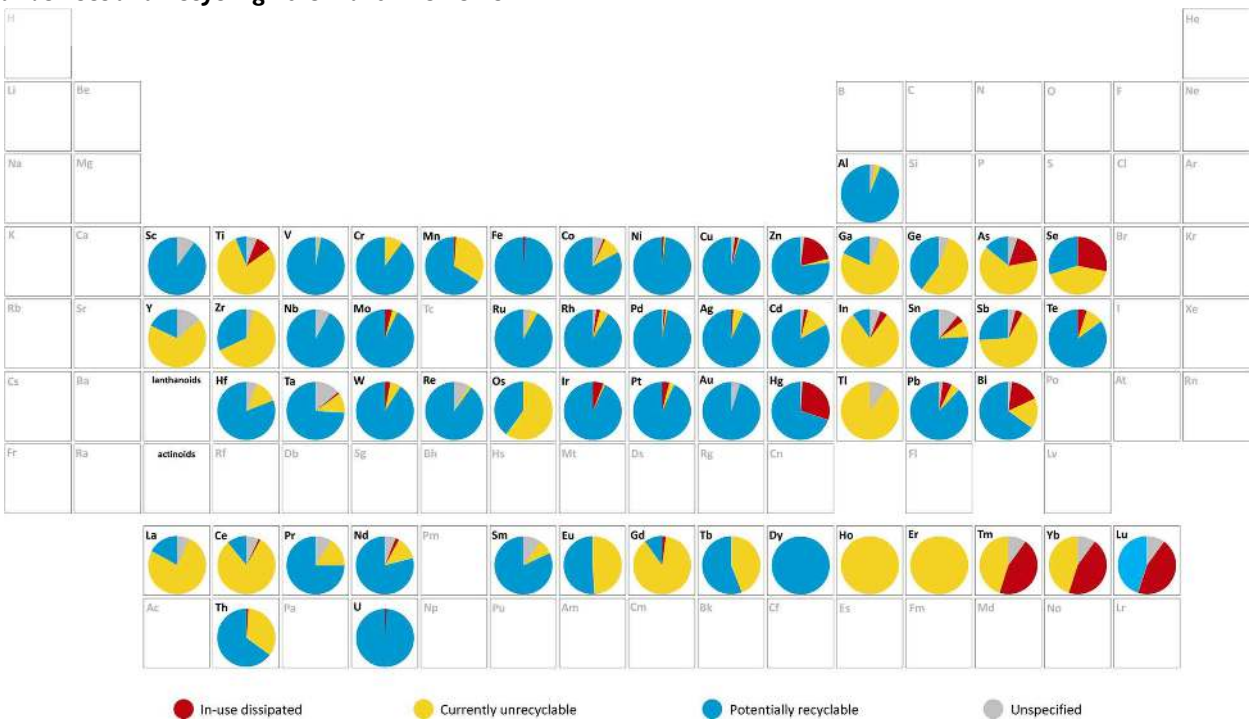
Perhaps the most interesting thing about the list (apart, of course, from its constituents) was Mr Pettinelli's description of its use, from a political standpoint, as a policy tool. Whilst he lead us to understand that policy actions are not limited to critical raw materials exclusively, he described the list as not only contributing to the implementation of the EU industrial policy, but also as incentivising the European production of critical raw materials and facilitating the launch of new mining activities. The list also helps monitor issues of critical raw materials to identify priority actions in, for example, trade, legislation and research.

In addition to the information he provided on the European Innovation Partnership (EIP) on Raw Materials platform (it is well worth perusing its area on the EU's website), one other piece of information with which Mr Pettinelli provided us was of particular interest. Of the €80 billion in funds available to fund the Horizon 2020 research and innovation programme, some €650 million has been earmarked specifically for raw materials. That's a great deal of money!

Dr Blengini's excellent presentation focused mainly on what he and his team are doing to refine and expand the European methodology used for defining criticality. Perhaps only to be expected, they are looking not only at accessing the most reliable data, but also at additional influences on criticality. (Discussion of these last included such issues as mining governance, land use, ore grade and by-production dynamics). But, for me, one of the most interesting things he told us is that they are looking also at both actual and potential uses of the critical raw materials list itself and, in this context, the issue of identification of the list's individual constituents by stakeholders, especially as, of course, these include EU member states. Apparently, whether a material is included on the list, or not, can have serious implications for those seeking funding and/or grants in connection with that material: i.e. if it's not critical, there may not be any money available!

For those interested in recycling (and note that end-of-life recycling is considered in Yale's criticality work), the presentation given by Luca Ciacci, entitled *The dissipation and recycling of metals (Loss because of product design)*, was particularly noteworthy. Dr Ciacci started by looking first at material cycles and dissipative flows with a description of the relevant life cycle phases. They are (linearly): **Mining → Smelting → Refining → Fabrication → Manufacturing → Use → Waste Management**. Following a brief look at the end-of-life recycling rates of metals, with particular reference to the UNEP's 2011 publication, *Recycling Rates of Metals*, we reached the core of Dr Ciacci's research in this area. This involves looking at different metals and establishing, for the important uses to which they are put, what percentage of each metal is: 1) dissipated in use (IUD); 2) currently unrecyclable (CU); and, 3) potentially recyclable (PR).

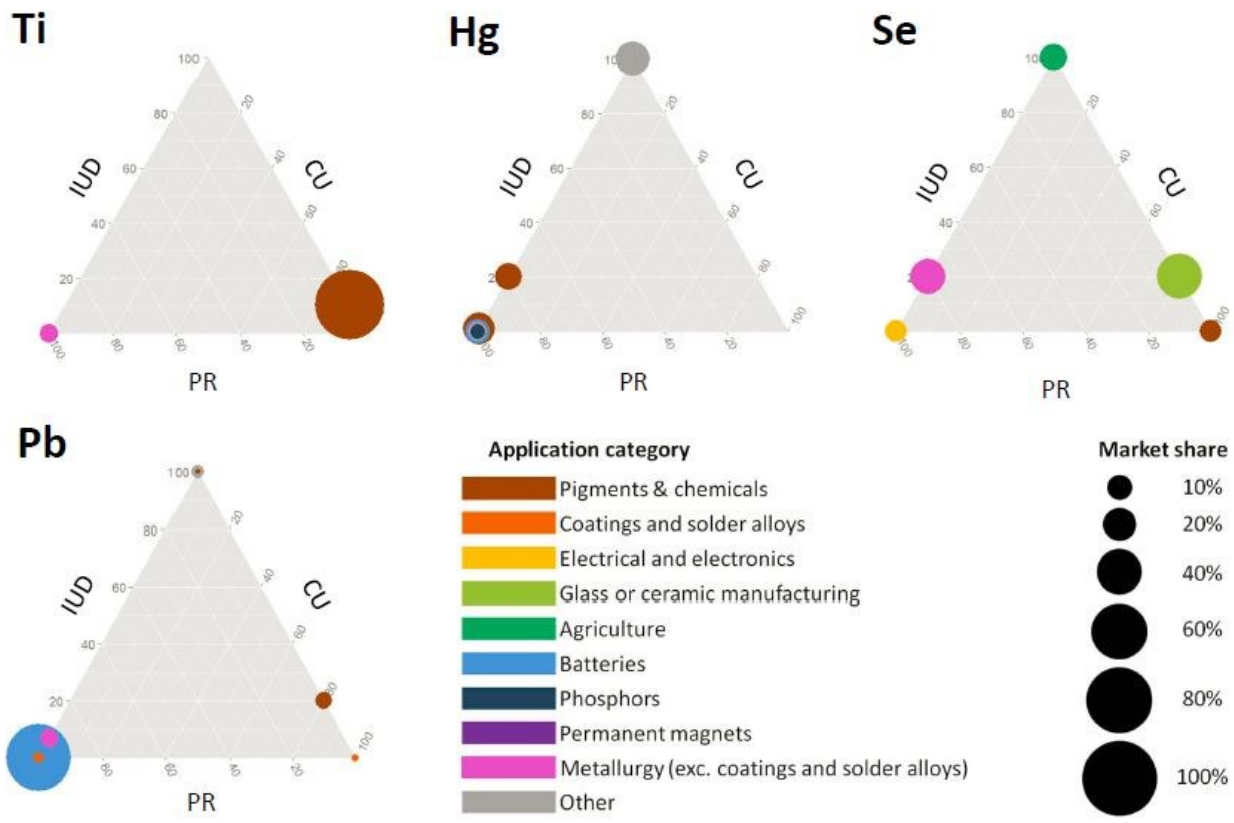
Dissipative Uses and Recycling Potential of Elements - 1



(Ciacci et al. *Environ Sci Technol* 2015, *10.1021/es505515z*)

As if, in itself, this was not helpful, or groundbreaking enough, with the examples of titanium, mercury, selenium and lead, Dr Ciacci then showed us how he has been able to combine this recyclability information with the market share of these uses for each metal.

Dissipative Uses and Recycling Potential of Elements - 2



(Ciacci et al. *Environ Sci Technol* 2015, *10.1021/es505515z*)

With this work on recycling potentials, it now seems that Dr Ciacci needs only, as it were, to "close the circle" for each metal by looking at how actual recycling rates match up to potential recycling rates. This is, I believe, something upon which he is already working. And which will, of course, be both enormously useful and absolutely fascinating.

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Titanium Sets the Golf World on Fire

In recent years, titanium has caught the eye of golf club manufacturers and amazingly, fire investigators. Yes, titanium clubs have the potential to spark upon striking rocks, creating one of the world's most unexpected fire hazards.

Although titanium drivers have been popular through the 2000s, manufacturers have increasingly been using titanium in wedge clubs as well, which are often used to hit balls out of rougher sections of the course. This has created an interesting problem. When titanium clubs strike rocks hidden in the foliage of the rough, they can create sparks which burn at extremely high temperature. These sparks have the potential to ignite foliage in hot, dry environments. A University of California Irvine study has confirmed the suspicions of California fire investigators that titanium clubs may be the cause of certain unexplained fires.

In the early days of golf, clubs were made of wood. Then in the second half of the twentieth century, club manufacturers introduced steel as the material of choice for golf club production. These clubs dominated the market for decades before metallurgical advancements offered new, high-tech alternatives. Perhaps most notable is the introduction of titanium's dominance as a face for woods, the clubs used for long distance driving. Currently, titanium faced clubs have an overwhelming market share of premium woods. There are a number of properties which make titanium a choice material in club design.

The property of hardness is a measure of how resistant a material is to shape change from force, such as striking a golf ball. Hardness is an important consideration in golf because it contributes to club longevity and the feel of a swing. Cheaper club faces made of aluminium or relatively soft alloys of titanium or steel are likely to indent and become damaged when repeatedly swung with the force of elite golfers. Harder alloys are required to prevent damage to the clubs, especially the club face. Titanium in some forms has hardness competitive to steel, allowing titanium clubs the same longevity along with other beneficial properties.

The primary benefit of titanium in golf is its low density. Density describes how much mass a substance contains per unit of volume. Titanium has a rather low density, close to 60% that of steel. This makes it lighter per unit. The lighter weight gives manufacturers the freedom to increase the size of club faces without making compromises on weight and balance, while maintaining the longevity of the club. The lightness of the metal face also allows manufacturers to choose where they would like the weight of the club located.

In recent years, tungsten has been introduced to club design as a shock absorber and counterweight in club faces. Using small pockets of the higher density metal, weight can be added to specific areas of the club face to improve the balance and feel of its swing. For example, inserting a small pocket of tungsten low on the face of the club gives it a lower centre of gravity.

Tom Murray, MMTA Intern

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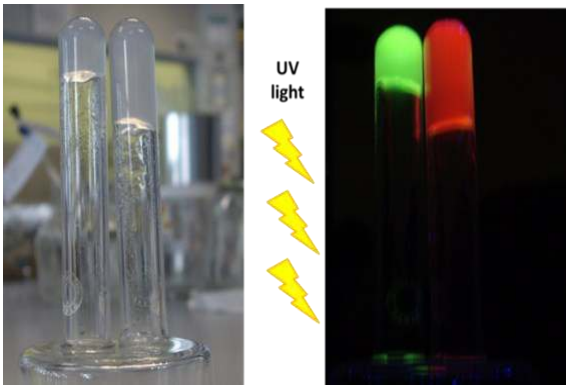
executive@mmta.co.uk

Self-healing, Luminescent Wonder Gels

Chemists at Trinity College, Dublin have invented self-healing luminescent gels with potential uses in science, medicine and electronics. Through the interaction between individual molecules (ligands) and europium and terbium ions, gels can be created which emit a luminous colour of choice when light is shined through. The luminous qualities of europium and terbium are already used in luminescent counterfeiting in Euro notes, but in the form of these gels, there are a multitude of new uses.



The luminescent quality means the gels can be used as indicators in sensors - changing colour when something changes in the immediate environment; uses in biomedical imaging and drug delivery within cells are 2 areas currently being investigated.

Aside from the luminescent quality of the gels, scientists are also excited about their 'self-healing' abilities. Dr Oxana Kotova, of Trinity College explains that "Because the gels exist as large networks of molecules, whose many individual weak interactions together form a much stronger matrix, they can be 'pulled apart' from any angle. However, these same properties mean that the gels will re-form, or 'self-heal' when meeting other gels of the same type."

This property has potential uses for seamlessly repairing not only smartphones and other screens or metallic surfaces, but also human skin. The team believes that "if we could find ways to make these gels biodegradable, there is no reason why we couldn't use them to heal up patients' wounds perfectly".

Source: http://phys.org/news/2015-05-chemists-self-healing-luminescent-gels.html

The MMTA enters into a mutual agreement with the CRM Alliance

The CRM Alliance has been created by industry to advocate the importance of Critical Raw Materials in Europe and promote our common interests. Supporting the CRM Alliance gives members a number of benefits, like regular information on EU issues affecting CRMs, meeting the policy-makers in the EU and exchanging best practices with other CRM industries. The CRM Alliance supports a critical materials policy based on 5 key recommendations: CRM policies should look for enhanced raw material supply and use rather than substitution of the CRMs; Industrial Sector Policies should incorporate and highlight the economic and strategic importance of Critical Raw Materials (CRMs) and their value to future innovation; Waste legislation should not include disincentives for usage of CRMs; Legislation affecting CRMs should require a special socio- economic analysis of potentially harmful impacts to the supply of CRMs; and Trade policy should incorporate principles of both free and fair trade for CRMs.

Contact: Heleen Vollers
Email: hv@crmalliance.org

To learn more about the work of the CRM Alliance, go to

http://www.criticalrawmaterials.org

Business Phone: [32] 0 213 74 22

Address: **Critical Raw Materials Alliance**

c/o Ridens Public Affairs

Rue de l'Industrie/Nijverheidsstraat 4

1000 Brussels

CRM Alliance
Critical Raw Materials

English Jurisdiction Clause

Effective in Restraining Court Proceedings Outside England

In a recent case involving an exclusive jurisdiction clause found in warehouse receipts/certificates, the English court upheld the enforceability of that clause to restrain court proceedings that had been brought in China.

- The dispute involved a warehouse company incorporated in the People's Republic of China (**Impala**) and a trading company incorporated in Singapore (**Wanxiang**) which is part of a Chinese conglomerate.
- The underlying dispute concerned a major fraud relating to aluminium ingots held at a bonded warehouse in Qingdao. Wanxiang had begun court proceedings against Impala in the Shanghai courts for recovery of the aluminium or damages.
- The warehouse receipts stated that they were subject to Impala's terms and conditions and referred to Impala's website where the terms could be viewed. The jurisdiction clause in question was found in Impala's terms, and provided that all contracts and claims between the parties relating to the goods would be governed by the law of England and disputes dealt with exclusively by the English courts.
- Impala, in the light of the jurisdiction clause, had sought injunctions from the English court requiring Wanxiang to discontinue the proceedings in Shanghai and to restrain it from commencing a claim anywhere else other than the English courts.
- Wanxiang argued that its claim was a non-contractual one which meant that the jurisdiction clause did not apply and the claim could be brought under Chinese law in the Chinese courts. Alternatively, it said that the clause had not been properly incorporated into the warehouse receipts and so was of no effect, or that there were other strong reasons why the clause should be departed from.
- The English court rejected all of these arguments and granted Impala a final mandatory injunction requiring Wanxiang to discontinue the proceedings in Shanghai, and a final prohibitory injunction restraining Wanxiang from commencing or continuing proceedings relating to the warehouse receipts anywhere else except the English courts.

PENNINGTONS MANCHES

For further information please contact **Nicole Finlayson**, Penningtons Manches LLP

In Brief

BBC Sport reported that Muay Thai boxer Bandasak Chaiyasan, was recently suspended for knocking out his opponent with a blow to the head with the added impact of a titanium implant. Defeated boxer, Noppadon Chalor, said of the knockout: "I have never felt anything like that kick".

Also on the BBC website, a sea turtle injured by the propeller of a boat has been fitted with a medical grade titanium 3D-printed beak. The animal is currently being monitored, and if the beak is not rejected, the loggerhead turtle will soon be returned to the sea.

Source BBC www.bbc.co.uk

Letter From America

Dear Members

So, summer appears finally to have come here in New York.

What better prelude could we have had than the excellent International Minor Metals Conference in Toronto at the end of April? For those who could not make it, I'm very sorry. For those who were there, wasn't it fun: both very informative and thoroughly enjoyable?

There was much icing, too, on the conference "cake", including the wonderful 5N Plus -sponsored evening of jollity, games and socialising at the Hockey Hall of Fame (Temple de la renommée du hockey) and Noah Lehrman as the modern-day balladeer for those who were able to listen to him and sip cocktails on the Sunday evening prior to everything. For me, too, an added treat was the group of superb Mies van de Rohe office buildings behind the hotel that constitutes the Toronto-Dominion Centre – truly Mies at his very best.

Coming back down to earth with somewhat of a thump, here in the U.S. Senator Lisa Murkowski (R-Alaska) is, once again, trying to overhaul federal policy on mineral resources. In this instance, as chair of the U.S. Senate Committee on Environment and Natural Resources, she has recently introduced proposed updating legislation in the form of "The American Mineral Security Act of 2015."

While focusing on materials critical to the likes of the energy, healthcare and technology industries, the bill singles out, in particular, not only the rare earth elements, but also other such metals as cobalt, lithium, scandium, thorium and yttrium. Will it go anywhere? Who knows? None of the other attempts over the past several years to revamp federal regulations covering mining appears to have had any degree of success.

As usual, while it was "published" in January this year, the U.S. Department of Defense's *Strategic and Critical Materials 2015 Report on Stockpile Requirements* actually only recently became available. And, as seems to be the norm now, received little, if any, mainstream press attention. Whilst the document appears to get thicker and thicker every year, as always it's worth wading through, not least for the appendices, which are some of the most interesting parts of the report.

Unsurprisingly, the report notes that, for the U.S., "*globalization creates a dependency on foreign sources of minerals, materials, and, finished goods.*" More importantly, though, it notes that this "*dependency is growing.*" Many such materials are vital for the defense, energy and technology sectors. For example, "*the United States' import reliance on tantalum is 100 percent, gallium 99 percent, titanium 79 percent, and cobalt 76 percent according to the USGS 2014 Mineral Commodity Summaries.*"

Apart from a particularly effective explosive, Defense Logistics Agency Strategic Materials has received authorization to acquire five materials "*in order to mitigate their supply chain risk*": ferro-niobium, dysprosium metal, yttrium oxide (including high purity yttrium oxide), cadmium-zinc-tellurium substrate materials and lithium-ion precursors.

Out of some 12 materials in the National Defense Stockpile exhibiting a net shortfall, excluding silicon carbide multifilament fiber, eight were metals. These were:

Aluminum oxide (fused crude)	Antimony	Beryllium metal	Europium
Germanium	Lanthanum	Magnesium	Manganese metal (electrolytic)

I shall look further at the report in my next letter at the end of the summer.

In the meantime, however, I remain, from a very warm New York, with best wishes for an excellent summer to MMTA Members everywhere.

Tom Butcher, May 27th, 2015 Hard Assets Investor ©2015 Tom Butcher

RC Inspection ISO/IEC 17020 Accreditation Announcement

RC Inspection is proud to announce it is now accredited by RvA, The Netherlands as an ISO/IEC 17020:2012 compliant organisation. RC Inspection underwent a rigorous evaluation process to ensure compliance to the quality management standard.

The accreditation of compliance with ISO 17020:2012 recognizes that the policies, practices and procedures of the company can be ensured with consistent quality and excellent expertise in the knowledge of the products and the services which we provide.

With this accreditation, clients can be ensured that RC Inspection is dedicated to maintaining the highest efficiency and responsiveness in achieving its ultimate goal—guaranteed client satisfaction.

RC Inspection is accredited for the following services:

To perform independent inspection and sampling services in the field of

- **Sampling and Preparations of Solid Fuels, Hard Coal / Coke**
- **Sampling and Preparations of Metals/ Minerals (Ferro Alloys, Ores)**
- **Inspection of Storage Facilities and Transshipment Equipment**
- **Inspection of Weight Determination by Gauging**
- **Inspection of Weight Determination by Draught Survey**
- **Loading Compartment Inspection (LCI) for Feed Transport**

To maintain the certification, the RvA will perform audits to ensure compliance and to assess initiatives for continued improvement. Therefore clients will be ensured that RC Inspection will continue to provide its high quality services in the future.

We believe that our decision to become ISO 17020 accredited is a proactive decision, that not only anticipates the demands of our clients, but also demonstrates our commitment to provide quality services to all our clients.

Yours sincerely

Ben Bender, ,

Managing Director

RC Inspection

The Politics of Compromise –

EU Conflict Minerals Regulation

Different Images of the Same Issue

Image: Global Witness—armed militia controlling mining operation

Image: Solutions for Hope Scheme—bag and tag scheme introduced to verify conflict-free material

In its vote on 20th May, the European Parliament overturned both the European Commission's proposal as well as the recent vote of the International Trade Committee. The Commission originally proposed a voluntary due diligence scheme aimed at breaking the link between the trade in tin, tantalum, tungsten, their ores and gold, and the financing of armed conflict.

What has followed has been an intense and prolonged period of lobbying and compromise. The business community, including the MMTA and other industry associations and bodies, have argued, not against breaking the link with conflict as some have claimed, but for a law that does not have the unintended consequence of hurting EU businesses more than it helps those in conflict affected areas. NGOs, such as Global Witness and Amnesty International, have lobbied hard, and the politicians of all persuasions – who clearly want this to become law – have debated, and compromised.

A Complex Issue

If you were to ask almost anyone the question "Do you want to make sure that the money you spend on your smart phone and other goods isn't funding armed conflicts and human rights abuses in Africa?", I think virtually everyone would answer, "Yes". So on one level this is a very simple issue, and one that almost everyone, politician and public alike, agrees on. However, that is where the simplicity ends. If you were to ask a different set of questions, the picture becomes far less clear:

"Do you want to prevent African miners living in poverty from being able to earn a living because it is far easier for businesses to demonstrate they are conflict free by avoiding the affected region completely than by undertaking the complex and costly regulatory requirements placed upon them if they source from the affected regions of Africa?"

"Do you want to disadvantage EU business in the world market by requiring them to comply with conflict minerals regulation which their competitors from other parts of the world are not required to do and are able, nevertheless, to place their products on the European market for European customers to purchase?"

"Do you want to limit the flows of these essential raw materials into Europe?" Tungsten is already designated by the EU as a Critical Raw Material (ie essential but with supply chain security concerns), and both tin and tantalum hover on the edge of the EU defined matrix. Both are considered extremely economically important, but at the moment are just under the threshold in terms of supply risk (see P 7 in this edition).

These are the complex considerations facing members of the EU Parliament, Council and Commission, and despite the fact that there is a high level of desire to break the link between metals (and other mineral resources), armed conflict and human rights abuses, they are struggling to agree on the best way to achieve this.

The Commission wants to allow EU importers to opt in if they wish to demonstrate to their supply chain that they are committed to being conflict free in their sourcing of these 4 metals and their ores. The left-of-centre parties in the Parliament, however, take the view that this position is driven by 'big business' and if it is a voluntary scheme, businesses will simply ignore it.

The EU Parliament International Trade Committee (leading on this issue) voted in April for a compromise position, whereby EU smelters and refiners would be bound by a mandatory requirement to undertake 3rd party audits ensuring they are only purchasing from conflict-free sources, but all those downstream of the smelters/refiners would participate in the scheme on a voluntary basis.

As with many compromises, this solution did not really please anyone, particularly the EU smelters and refiners, who only making up 5% of total global smelters/refiners, saw themselves being simply bypassed by their supply chain because non-EU smelters/refiners would not have to comply with the regulation at all.

European Parliament Vote

So on 20th May, the latest step in the progress of this complex regulation took place. The April compromise vote was overturned by the full European Parliament, which voted by a majority to overturn the Commission's proposal and requested mandatory compliance for 'all Union importers' sourcing in conflict areas.

In addition, 'downstream' companies, that is, the 880 000 potentially affected EU firms that use tin, tungsten, tantalum and gold in manufacturing consumer products, will be obliged to provide information on the steps they take to identify and address risks in their supply chains for the minerals and metals concerned.

As metal smelters and refiners are the last point at which the minerals' origin can be effectively traced, MEPs have gone beyond the Commission's 'self-certification' approach by calling for smelters and refiners to undergo a compulsory, independent, third-party audit to check their 'due diligence' practices.

Parliament has accepted several key industry priorities:

- It will ask the Commission to grant financial support to micro-businesses and small and medium-sized firms wishing to obtain certification through the EU's COSME programme (EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises);
- It is insisting on tougher monitoring of the scheme, with a review two years after it is applied and every three years thereafter (instead of after three and six years respectively, as planned by Commission). This will hopefully ensure that whatever form this regulation ultimately takes, there will be scope to review and adapt aspects of it that are not working. A key detail here will be who is involved in the review process and whether the experiences of businesses will be taken into consideration;
- There has been agreement on the exclusion of recycled materials from the scope of the regulation;
- The recognition of existing industry schemes is included in the draft law.

Geographical scope

The regulation applies to all conflict-affected high risk areas in the world, of which the Democratic Republic of Congo and the Great Lakes area are the most obvious example. The draft law defines 'conflict-affected and high-risk areas' as those in a state of armed conflict, with widespread violence, the collapse of civil infrastructure, fragile post-conflict areas and areas of weak or non-existent governance and security, characterised by 'widespread and systematic violations of human rights'.

Next steps

Parliament will now enter into informal talks with the EU member states (the Council) and the Commission to seek agreement on the final version of the law. There is an expectation that the mandatory proposal as voted for by Parliament will not be accepted by the Council, representing Member States with widely differing views, so this exercise in compromise is far from over.

The MMTA would like to hear from interested Members who would like their views included in our future communications to Members of Parliament, the Council and the Commission. Please contact the Executive Team.

Maria Cox, MMTA

VOTE AT A GLANCE

- All companies first placing covered resources, including products, need to conduct and publicly report on their supply chain due diligence (the inclusion of products is new and is a big change)
- Existing industry schemes aimed at breaking the link between conflict-financing and sourcing of minerals could be recognised in the Union system, though criteria and procedures need to be defined
- SMEs should be provided with technical and financial assistance e.g. via the COSME programme
- Smelters and refiners should undergo an independent third-party audit (although existing scheme audits should be acceptable assuming they agree on recognition element)
- Two-year transition period for the Commission to set up a third-party audit system
- Two years after the date of application of the Regulation and every three years thereafter, Commission to review functioning and effectiveness of Regulation with a view to proposing further mandatory measures (a key aspect here will be whether there is industry involvement in the review process)
- Regulation lays down supply chain due diligence obligations of ALL Union importers who SOURCE minerals and metals covered by the EU scheme
- However, it shall draw a distinction between the roles of UNDERTAKINGS situated upstream and downstream
- Downstream companies shall take all reasonable steps to identify and address risks arising in their supply chains and they shall provide information on their due diligence practices
- Importer means any natural or legal person established in the Union making a declaration for the release for free circulation of minerals and metals covered by the scheme (including products)
- Recycled metals shall be excluded from the scope of the Regulation
- Definition of "industry schemes" – (the schemes will be required to make submissions to be included as equivalent)
- Commission to adopt and make publicly available a list of responsible importers of minerals and metals
- But also list of responsible smelters and refiners taking into account existing schemes
- In consultation with the EEAS, Commission to prepare a handbook to help companies with the identification of conflict-affected and high-risk areas
- Commission shall submit a legislative proposal within the transitional period setting-up accompanying measures foreseeing incentives, technical assistance and guidance for responsible sourcing; policy dialogues and development cooperation with third countries and complementary initiatives with Member States in the area of consumer and customer information.

Technology Metal Procurement & Recycling

Technology metals, which include today's strategic metals, incorporate minor metals and rare earth elements (REEs), and are present in almost every advanced electronic device and system. Without their contributions, major technological advances in recent decades would have been impossible. Applications for many of these elements were developed long after their discovery, influenced by 20th century military advances. Critical today for the function of modern society, civilian and military, the properties of technology metals are essential components of the present and future.

The late 18th to the early 19th century pioneered the discovery of the majority of minor metals and REEs, yet until World War II and into the Cold War, many of the past and current-day technology metals had little or no use. Today, major industries leveraging these materials include those involved with the production of micro-electronics, such as those found in miniature devices like smartphones, military weapons systems, aerospace, and electricity generation and storage.

The military industrial complex, historically responsible for the creation of many technologies later absorbed by the commercial sector, was behind much of the development of innovative technologies incorporating minor metals and REEs. Putting aside economics for national security, small and normally prohibitively expensive quantities of the metals were acquired for research in the mid to late 20th century. As a result of the subsidies and special projects, advanced military technologies were created and later trickled into the civilian marketplace.

Man separates electronic equipment in his garden near Guiyu, China—centre for e-waste processing. *Photo Credit: Bit Rot Project*

Today, since technology metals are relied upon by civilians and the military, discussion has surfaced around supply concerns in the US and abroad. The issue is well known - the source of many of these metals is China. In addition, the capacity to refine and smelt minor metals and REEs are outside of the US, primarily in China. Past and recent disputes with the Asian nation have elevated policy discussions.

In a report by the US Department of Defense (DoD) titled, "Strategic and Critical Materials 2013 Report on Stockpile Requirements", the DoD states there is an insufficient supply of 23 materials, dubbed critical, composed primarily of technology metals. It further adds that although some of the shortfall affects the military, it is primarily the civilian sector that may suffer. Traditionally stockpiled to meet demand, the DoD has suggested other alternatives to relieving the shortfall, such as substitution, increased acquisition from reliable suppliers, and reducing supply to those producing products for export.

World resources of technology metals are enough to meet demand, but the US Geological Survey states that current production falls short. From this argument and positioning of the US government, their priority seems to fall on the need to create stronger and more reliable supply chains for technology metals, which could include recycling, and advancing research into alternative materials with similar attributes.

Substitution and the development of new materials with properties similar to technology metals is a strategy they hope will bear fruit, although much progress is needed in practice. Japan is one country involved in leading this effort via innovation in nano-technology, also known as nano-innovation. Starting in the early 2000s, research into this field by the country was propelled partly by its leadership and experience in semiconductors. By 2006, Japan and the US accounted for around 75% of global corporate investment in nanotechnology. The combination of government efforts, paired with world-class commercial and academic institutions have led to new materials that act as substitutions, including one example involving rhodium and palladium, both expensive and increasingly scarce materials.

Substitution not only involves materials, but includes the evolution of technologies. Kyoto University, in tandem with Sumitomo Electric, announced in 2011 that they had found methods to improve upon and replace lithium ion batteries. At a fraction of the cost, their battery used sodium and was claimed to enable vehicles employing the technology to travel twice the distance than those using lithium ion technology; a more environmentally friendly alternative.

The other primary options for offsetting the risk in the lack of US mineral supply of minor metals and REEs include domestic mining and recycling, although the infrastructure to implement these options is far from reality, but always an attainable possibility.

Part of China's competitive advantage over other nations concerning technology metals includes its large mineral deposits, low labour costs and environmental regulations and oversight that are less stringent than those found in Europe and the US. Each barrier to entry brings its own challenges.

China also has an extraordinary reuse market. A chip used to power a smartphone has other applications outside of the phone. Its lifespan can be extended for years when reused and placed into an LED screen that powers signs, for example. The value of the chip is of course worth much more than the result of smelting its materials. Not only is this method more economical than sending the chip through the full recycling process, but it also reduces or delays the impact on the environment.

A ton of e-waste normally contains a higher concentration of technology metals than the ore from which they are derived. But fully integrated recycling efforts in the US do not exist and so electronic waste diverted from landfill is minimally processed in the US, and is sent abroad for recycling. Materially speaking, this is at a great loss to US firms.

Current processes to capture, refine and smelt technology metals include mechanical separation, pyrometallurgical, and

hydrometallurgical methods, all of which need further development. The chemical separation techniques were created in the 1950s and continue to be used today without drastic innovation. These processes have high costs, notably associated with high-energy demand and the environmental impact from chemicals used in leeching and solvent extraction. All of these processes therefore require large investments in infrastructure, and completion of the timely and costly environmental and regulatory compliance - all large barriers to entry for firms in the US and Europe.

Companies across the globe leading recycling efforts in e-waste include smelters such as Boliden, Xstrata, Aurubis and Umicore, none of which are located in the US. 25 US states have laws addressing recycling, although they fall short of a dedicated effort. To create a US option, big risks must be addressed like the initial required investment in infrastructure, which could become obsolete with the advent of new technologies and materials. Note too, that with current recovery techniques it is difficult to isolate desired metals during recovery. The efficiency of the science behind current processes also lacks the ability to curb the loss of materials, like in pyro-metallurgical processes.

Woman in Lahore, Pakistan takes apart imported electronic devices. *Photo Credit: Bit Rot Project*

Efforts are underway to find solutions to the waste stream as current and new technologies incorporating technology metals continue proliferate society. Already, many dealers in the US are collecting e-waste. But to fully domesticate efforts, large networks, highly capable of being created with modern day technology and data systems, must be created for categorizing, collecting and organizing e-waste. Following this, the capacity to recycle and smelt the materials must be addressed through extraordinary investment. The success of these initiatives will eventually result in lower environmental impacts and decreased reliance on Chinese exports. The cost savings will arrive in the form of government subsidies.

Major manufacturers and distributors of products leveraging technology metals can increase control over their own supply chains, primarily through programs leveraged to take back products at their end-of-life. This can also incorporate the modular design of products so obsolete components can be replaced in lieu of replacing entire devices. Shifting to a service-based business model for products would entail companies owning the devices, and therefore taking responsibility for the products throughout their lifecycle. As an incentive to implement these programs, government investment through subsidies and stronger regulations are necessary. It is more difficult, economically and logistically, for companies to create programs around current regulations, then if they had the support of the government.

This brings us back to the risk involved in the lack of domestic supply of technology metals. If there were another major global conflict, excluding the current conflicts in the Middle East, government measures would be taken via subsidies and secret programs to secure necessary materials. It has happened in the past with strategic materials, and can and will be done in modern times if needed.

From the consumer side there may also not be much to worry about. If materials become exceedingly expensive, the market will shift to create new approaches to existing technologies, replacing what is not economically feasible. In addition, and with thanks to small portable devices, data centers, satellites and other essential components of current day communication systems incorporating technology metals, consumers are becoming better informed. As consumer preferences evolve towards products that are better for the environment and society, such as those made without conflict materials, or certified to an environmental standard, demand will shift business practices and producer responsibility. Efforts addressing these concerns are already in place and include WEEE, REACH and RoHS in Europe, and the SEC conflict materials rule in the US. These efforts will eventually result in stronger supply networks, which could one day equate to vertically integrated US supply chains.

Risks in supply chain disruptions will always exist, and the ingenuity of capitalism will continue to create solutions for risk. As technology metals stay at the forefront of discussions in the commercial and military sector, problems will continue to be addressed by a number of global players. The advancement and impact of these solutions, undeniably in their nascent stage, will rely on the seriousness of the situation and successful joint efforts between the private sector and government.

Bryant Dulin, MMTA Sustainability Working Group

SOME E-WASTE FIGURES

- In 2012, 50 million tons of e-waste was generated worldwide.
- The United Nations estimates that with all the smartphones and other hi-tech gear, this figure will rise by 33% to 65 million tons by 2017.
- Unused electronic goods are either recycled (circa 30%) or simply thrown away.
- Around 80% of the e-waste produced in developed countries (North America and Europe top the list) is not disposed of at home, but is shipped—mostly illegally—to developing countries, where it is disposed of.
- The appeal of sending e-waste abroad to be disposed of rests on lower labour costs and fewer regulations—the cost of disposing of a PC by sending it to Africa is $2, as opposed to $20 to sustainably recycle it in the US.
- Once salvaged, tech waste will end up back in many of our homes, as it is purchased by many of the same companies who make the hi-tech gadgets in the first place.

Source: EcoWatch—*Stunning Photos Capture Devastating Worldwide E-Waste Problem*

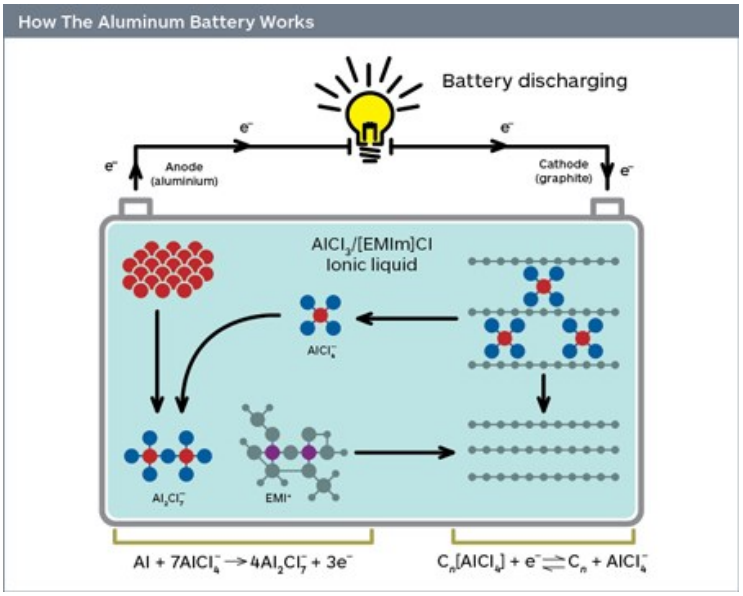
Lithium Upstaged?

Aluminium batteries have been in the news recently as a viable challenger to lithium-ion cells. Researchers from Stanford University have created a fast-charging, inexpensive, long-lasting and flexible aluminium battery.

The researchers cite the cost of lithium-ion batteries as a barrier to entry into the automotive market, which is where cheap aluminium comes in. Aluminium has long been an attractive material for batteries, mainly because of its low cost, low flammability and high-charge storage capacity. For a long time, researchers have tried unsuccessfully to develop a commercially viable aluminium-ion battery. A key challenge has been finding materials capable of producing sufficient voltage after repeated cycles of charging and discharging.

The prototype battery developed at Stanford has a discharge voltage of about 2V and an energy capacity similar to lead acid and nickel-metal hydride batteries. It is also reported to have lost little of its storage capacity after 7,000 cycles compared to lithium batteries, which only last for about 1,000 cycles. Researchers also say the battery can be completely recharged in less than 60 seconds.

These attributes may lead to future applications in small electronic devices, but aluminium batteries could also be used to store renewable energy on the electrical grid, which requires a battery with a long cycle life. As always, the road to commercialisation is long and complex, and with the recent developments in lithium-ion battery industry, the competition between these two technologies may prove interesting.



The full article can be found here:

http://news.stanford.edu/news/2015/march/aluminum-ion-battery-033115.html

The research "*An ultrafast rechargeable aluminum -ion battery,*" has been published recently in the journal ***Nature***.

Tamara Alliot, MMTA

Disappearing/Reappearing Molybdenum Telluride

Adapted from an article published on phys.org

When exposed to air, luminescent 2D material, molybdenum telluride ($MoTe_2$), appears to decompose within a couple days, losing its optical contrast and becoming virtually transparent. But when scientists probed further, they found that the disappearance is an illusion and the material remains structurally stable, and only its material properties change. The results offer clues into the stability and unusual properties of a newer class of 2D materials called transition metal dichalcogenides (TMDs).

The results show that the defects play a significant role in the optical properties and stability of $MoTe_2$, and could also reveal insight into the environmental stability of other TMDs, such as silicene (2D silicon), phosphorene (2D phosphorous), and other TMDs. It could also lead to ways to control these materials' properties.

Applications for this type of materials are as yet unclear, but an invisibility cape seems like a good objective to me.

Read more at: http://phys.org/news/2015-05-two-dimensional-material-doesnt.html#jCp

The research: Bin Chen, Hasan Sahin, et al. "Environmental Changes in $MoTe_2$ Excitonic Dynamics by Defects-Activated Molecular Interaction." *ACS Nano*. DOI: 10.1021/acsnano.5b00985

Tamara Alliot, MMTA

EU Critical Raw Materials:

Essential for your business & your industry now and in the future

Draft Agenda	Speaker
The German political approach to the importance of CRMs	**Dr. Christian Kühne** Ministry for Environment, Climate & Energy, Baden-Württemberg
What is EU policy towards critical raw materials (CRMs)?	**Alexis Van Maercke** Policy Officer – Raw Materials, DG GROWTH
Supply risk and economic importance — what makes a material 'critical'?	**Luis Espinoza Tercero** Frauenhofer Institute
The role of the CRM Alliance in promoting and defending CRMs in Brussels	**Maurits Bruggink**, Secretary General, CRM Alliance
Q & A and Wrap Up From Morning Session	**Christian Payn**, IMA

LUNCH & NETWORKING

Panel Discussion—What is the risk? Case studies looking at different elements of supply risk and economic importance for Europe	Moderator: **Martin, Tauber**, President CRM Alliance
• New European primary production of Mg in Turkey	**Ilhan Goknel** ECZACIBASI ESAN
• Difficulty of developing primary production in Europe (REEs)	**Mark Saxon** Tasman Metals
• The trader view on supply risks	**Armin Buschhausen**, MD, Cellmark Germany
• Trade issues and restrictions including new exchanges	
• Candidates for substitution (In)	**Claire Miko** Indium Corp
The Way Forward	**Maria Cox**, MMTA

SHOWCASING OF DLR PROJECTS

NETWORKING DRINKS

International Magnesium Association

www.intlmag.org

mmta minor metals trade association

www.mmta.co.uk

When?

Wednesday 16th September 2015

Where?

German Aerospace Center (DLR)

Institute of Vehicle Concepts,

Stuttgart, Germany

Who should attend?

Members of the MMTA and IMA, and others interested in the increasing impact of EU CRM policies on their business and the industry.

What?

This one-day seminar at the world-renowned German Aerospace Center in Stuttgart combines:

- must-have information
- the opportunity to speak directly to policy makers
- valuable networking

Cost:

MMTA/IMA Members: €350/£250

Non-members: €450/£330

For more information or to register, go to http://www.mmta.co.uk/events/2015/09/16/222

or contact

executive@mmta.co.uk

This is a joint seminar by the MMTA and IMA and is kindly hosted by

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