

The Crucible

Brexit: In Pursuit of Clarity

MMTA Member Focus: Hunan Jinwang Bismuth

China Lithium Developments



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"Delivering a conflict-free supply chain", by **Carolyn Duran, Director, Global Supply Management, Intel Corp, USA;**

"An update on specialty and stainless markets", by **Markus Moll, Managing Director, SMR GmbH, Austria;**

"Coatings for gas turbine blades", by **Dr Lisa O'Donoghue, University of Limerick, Ireland;**

"Tomtor — an alternative source of supply for scandium and niobium", by **Alexander Malakh, Chairman of the Board, TriArc Mining Ltd;**

"Energy storage and its applications", by **Professor Peter Hall, Chair in Chemical Engineering, The University of Sheffield, UK;**

"The lithium ion battery mega factories: Lithium, graphite and cobalt impact", by **Andy Miller, Analyst, Benchmark Mineral Intelligence, UK;**

"Cobalt and lithium supply requirements", by **Rebecca Gordon, Consultant, CRU Consulting, UK;**

"Future applications for minor metals: Bi, In, Se, Ge, & Ga", by **Dominic Boyle, PPM Pure Metals GmbH, Germany;**

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High-energy supercapacitor could revolutionise battery power storage

Adapted from Supercapacitor Materials Ltd

By **James Walsh**, MMTA

Ground-breaking research from the University of Surrey and Augmented Optics Ltd., in collaboration with the University of Bristol, has developed potentially transformational technology which could revolutionise the capabilities of appliances that have previously relied on battery power to work.

This development by Augmented Optics Ltd., could translate into very high energy density super-capacitors, making it possible to recharge your mobile phone, laptop or other mobile devices in just a few seconds.

This new technology could have a huge impact across many sectors, including transport, aerospace and energy generation. A little more tangibly for the general public is in household applications, such as mobile phones, and flat screen electronic devices.

It could also revolutionise electric cars, allowing the possibility for them to be recharged as quickly as it takes for a regular non-electric car to refuel with petrol – a process that currently takes approximately 6-8 hours to recharge.

Imagine, the new technology could allow the electric car to travel greatly extended distances without the need to recharge, and when it did recharge, for this operation to take just a few minutes to perform.

The University of Bristol says it is “proven to be between 1,000-10,000 times more powerful than the existing battery alternative”.

Supercapacitor buses are already being used in China, but they have a very limited range, whereas this technology could allow them to travel a lot further between recharges.



Elon Musk, of Tesla and SpaceX, has previously stated his belief that supercapacitors are likely to be the technology for future electric air transportation. The new scientific advance could make that vision a reality.

The technology was adapted from the principles used to make soft contact lenses, which Dr Donald Highgate (of Augmented Optics, and an alumnus of the University of Surrey) developed following his postgraduate studies at Surrey 40 years ago.

Supercapacitors, an alternative power source to batteries, store energy using electrodes and electrolytes, and both charge and deliver energy quickly, unlike conventional batteries which do so in a much slower, more sustained way.

Supercapacitors have the ability to charge and discharge rapidly over very large numbers of cycles. However, because of their poor energy density per kilogramme (approximately just one twentieth of existing battery technology), they have, until now, been unable to compete with conventional battery energy storage in many applications.

Dr Brendan Howlin of the University of Surrey, explained: “There is a global search for new energy storage technology and this new ultra capacity supercapacitor has the potential to open the door to unimaginably exciting developments.”

Source: <http://www.supercapacitormaterials.com/>

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Letter From North America

Dear Members

Much has happened since I wrote you on November 8th last year: The old year has passed and we are now getting stuck in to 2017; Mariah Carey's concert in Times Square on New Year's Eve was a shambles; and we here in New York are yet to experience any proper winter weather. Having said that, though, looking out of the window now, it's actually snowing.

Oh, and yes, since I last wrote we now have our 45th president (elect) – Donald Trump. And what a surprise that was. To give you an idea of the trauma this caused in some quarters, at the hideously expensive private high school up the block from us, the weeping, wailing, and gnashing of teeth amongst the pupils was so great on November 9th that the school had to be closed for the day!

One of my oldest friends back in England sent me a sweet e-mail with the subject line "Commiserations". Whilst the temptation on her part to indulge in a degree *schadenfreude* must have been quite strong, instead she put things in terms, from her side, of Brexit. I was therefore able to draw some comfort from her words.

But nobody really knows what's going to happen after the inauguration on 20th January. This probably includes Mr Trump himself. There's obviously lots of stuff he'd love (and has promised) to do. But whether he'll actually be able to do it is another matter altogether.

So, what does his election (and Republican control of both houses) mean for MMTA members? This, too, is uncertain. Mr Trump has sounded off about both TPP and TTIP. My guess is that TTIP won't happen and that TPP could still happen, but without the U.S. – for what that'll be worth.

Many have long argued that the granting of permits for mining and exploration here in the U.S. is a true mess. I think we may, now, see some moves on this front. Indeed, there may, quite soon, be some action in the House on the National Strategic and Critical Minerals Production Act. Not least as one of the co-sponsors of the act is now Mr Trump's nominee for Secretary of the Interior, Congresswoman Ms Cathy McMorris Rodgers.

On the alternative energy front, I don't have any clarity on what might happen. Whilst Mr Trump has, very publically, espoused a love for coal, coal miners, and the coal industry in the U.S., I cannot remember his having actually been 'anti' alternative energy. So, once again, we'll just have to wait and see.

As many of you will have seen, one of the ways currently being mooted within the administration-to-be to help make America great again is the imposition of a tariff on all imported goods. At one point in his campaign, Mr Trump pitched such a tax at 45%. The current thinking is a little lower – 5%.

If the concept is developed further, the interesting thing will be what is defined as a "good". Will imported raw materials be

included? Since, if I remember correctly, a great many of the metals mined, refined, worked, sold and traded by our members have to be imported by this country, this tax will certainly be something to keep an eye on.

As for any changes Mr Trump and his team may make at places like the EPA and how these may affect members,

I'm afraid I know nothing. Once again, we'll just have to wait and see.

Whilst I must apologize for not being able to provide you with any real concrete direction on what's going to start happening in a couple of weeks, I think I may not be alone in this respect. Rest assured, though, that, in coming missives, I shall try to highlight anything that might help provide some insight as to where we here are headed and how this may affect MMTA members.

In the meantime, though, I should like to wish all members everywhere a very happy, if somewhat belated, New Year and the best 2017 possible.

As always, I remain, with best wishes from New York

Yours

Tom Butcher, January 8th, 2017

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EU Anti-Dumping Update

December 11th marked the anniversary of China's 15 years as a member of the World Trade Organisation (WTO). It was expected, by China, that they would finally attain "market-economy status" and an end to being labelled a "non-market economy". The European Union and America have refused to acknowledge such a transition, leading to China pursuing legal action.

The row focuses on the wording in the original accession agreement and concerns the method WTO members use to protect their industries against cheap Chinese imports. The agreement welcoming China into the WTO gave other members licence to treat it as a non-market economy until December 11th 2016, meaning they could ignore domestic prices when assessing the appropriate value of Chinese imports.

China has expected to be treated like any other market economy by other WTO members from this date onwards; whereas America's position is that after December 11th, China is no longer automatically a non-market economy. But WTO members can use their discretion as to whether it is a market economy, and since, according to America's own criteria, China is not, it can keep using third-country prices in anti-dumping cases.

The European Commission has presented a proposal for a new method for calculating dumping on imports from countries where there are significant market distortions, or where the state has a pervasive influence on the economy. The purpose is to make sure that Europe has trade defence instruments that are able to deal with current realities – notably overcapacities – in the international trading environment, while fully respecting the EU's international obligations in the legal framework of the World Trade Organisation (WTO).

The EU is responsible for ensuring that its trade defence instruments (TDIs) remain effective in dealing with significant market distortions in certain countries that can lead to industrial overcapacity, and that encourage exporters to dump their products on the EU market. This causes damage to European industries, which ultimately can result in job losses and factory closures, as has been the case recently in the EU steel sector.

The proposal should be seen in the context of the October European Council's call for an urgent and balanced agreement on the Council position on the comprehensive modernisation of all trade defence instruments by the end of 2016. Reforming the anti-dumping methodology would be an important part of the reforms needed, on top of the modernisation of all TDIs which the Commission proposed back in 2013.

This new anti-dumping methodology would apply to cases initiated once the amended rules are in force. The proposal also includes a transition period during which all anti-dumping measures currently in place as well as ongoing investigations would remain subject to the existing legislation.

Even if China wins the initial set of cases, WTO law does not force other countries always to use exact Chinese prices in their anti-dumping measures. The full scope of what they can do is still legally uncertain.

As the WTO have not provided a clear definition of a "market economy", there is a difficulty in fitting China's particular type of capitalism into a binary view of a market, or non-market economy. A long drawn out legal battle is now expected, not made any easier by President Trump's protectionist "American First" views on trade.

Source: <http://www.economist.com/news/finance-and-economics/21711911-donald-trump-might-get-trade-war-without-even-trying-early-salvo-trade>

China Lithium Developments

By **China Nonferrous Metals Industry Association - Lithium Branch (CNIA-Li)**

Since new energy industry was the key support orientation in the "Made in China 2025" National Strategy and during the 13th-Five-Year Plan period, China plans to accumulatively manufacture and sell 5 million new energy automobiles by 2020. The world's major automobile producers also put forward the development program of the electric car, according to which the global production of new energy automobiles is estimated to total more than 13 million units by 2020.

In recent years, China's new energy industry experienced an explosive development due to the continued policy support and rising demand in China, and China's lithium industry maintained high growth momentum. There was strong demand in China's lithium carbonate market; with the lithium price soaring and tight supply.

Despite abundant lithium resources, large-scale production of lithium has not been developed in China, restricted by many conditions, and China mainly imported lithium from South America and Australia, etc; leaving domestic lithium battery and new energy automotive technology lagging far behind developed countries

such as Japan and South Korea.

If there is no improvement in the domestic situation, with scientific research institutions isolated from production enterprises, and lack of technological innovation ability, lithium resources and technology may be dominated by a few large foreign companies, following the same old disastrous road of iron ore and sylvite several years ago.

As a global lithium resource-rich country, how to effectively develop and utilize lithium resources in China? And as a main producer of automobiles, how to make progress in the field of new energy vehicles? Under this background, and to implement the "innovation-driven development" strategy by the Central Government, the 2017 International Lithium Conference will be held, co-hosted by Chinese Academy of Engineering (CAE) and China Nonferrous Metals Industry Association (CNIA) on March 14-16, 2017.

The conference will invite officials from government sectors, experts and scholars of leading enterprises at home and abroad, and scientific research institutions to set up a communication platform of the lithium industry, promote the combination of production, study and research, combination of national policy and enterprise appeal, and a combination of upstream, middle stream and downstream sectors within the lithium industry chain, and discuss the technology development trend of the lithium industry.

MMTA Member Focus:

Hunan Jinwang Bismuth Industrial Co Ltd.

By Maria Cox, MMTA

During my recent visit to China to participate in the CNIA Global Minor Metals Forum (China), I was delighted to be invited to visit the Hunan Jinwang Bismuth Industrial Co Ltd plant in Chenzhou, Hunan Province. After experiencing the wonderful high speed train (for an English person, suffering endless train strikes and a creaking, over-crowded service, this was a great experience in itself), we were met and transported to the factory by car by our hosts. My companion was Fan Li, who many of you may know from Metal Events, and who will be assisting MMTA with Chinese membership development.

The plant is at the forefront in the development of a circular economy operation by extracting bismuth from copper smelting soot, and from all kinds of bismuth-containing waste materials from smelters, and recycling them. In this way, the company has been able to close the loop between production and consumption and ensure the full utilisation of these natural – and valuable – resources, whilst at the same time minimising the negative environmental impacts caused by untreated secondary materials.

Founded in 2001, Hunan Jinwang Bismuth Industrial Co Ltd (Jinwang) has developed rapidly and invested heavily in scientific research and innovation. Walking around the site, there is clearly a great deal of pride in what the company has accomplished in a relatively short period of time. The plant is modern, and the company is looking towards ongoing development of new processes and equipment.

An example is the Xianxi Main Workshop, which provides a cutting edge bismuth smelting process producing lead bullion or lead bismuth alloys, with sulfuric acid as a by-product of the process.

The company's aim is to establish an ecological industrial park, focussing on the circular economy and supporting the Chinese economy by returning valuable secondary resources to use, as well as contributing to efforts to protect the environment.

The main technology used by the Xianxi factory is the melting of an oxygen-enriched double blow pool, which is the first time such technology has been used in the bismuth smelting processing in the world. The new technology can absorb any kind of bismuth containing materials in the world, and compared to the traditional technology of bismuth processing, it improves processing time and also the ability to process complex material.



So, Jinwang has built one of the largest bismuth smelting and processing enterprises in the world. And the company contributes to the recycling economy and demonstrates clean smelting in the non-ferrous metal smelting enterprises.

It is clear to me that this commitment to the environment is an important company goal, and I'm interested to understand how these environmental goals help to attract employees and inspire them in their work. I'm told that Jinwang's Chairman Mr. Wu Zuxiang, is very focussed on employee benefits, and health. From his own experience of 20 years ago, when he started his career, it was from a homemade smelting plant, which was very simple and provided no protection, not even any environmental protection system. At that time, there were hundreds and thousands of these homemade smelting plants in China. So, Mr. Wu decided to change things, which led to him building a new smelting plant and new environment system, to set up a new standard of bismuth smelting plant.





Apart from bismuth in many forms, the plant produces silver, gold and tellurium for a range of metallurgical and industrial processes, as well as operating separate chemical and pharmaceutical plants.

After visiting the main smelter plant, our guests took us to view the chemicals plant – producing bismuth chemicals for a range of salts, coatings and cosmetics, where it provides the pearlescent finishes to many products. Its wide and varied end uses include bismuth oxide, which has uses in electronics, military and medical applications, as well as being a semiconductor, and bismuth subsalicylate, used as an antibacterial.

Bismuth oxide technology: Our hosts explain that “our production of bismuth oxide is amongst the leading technology in the world – Arc method bismuth vaporization”, which is efficient and offers environmental protection, as well as a reduction in costs. Arc method bismuth vaporization is a direct combination of oxygen in the air, without any subsidiary material. Compared to the traditional, wet bismuth process, it won't produce any waste material, ie waste water and waste gas and other environmental

hazards. And even better, the cost is only fifty percent of the traditional process.

The bismuth products produced include bismuth needles, bismuth oxide, bismuth chemicals, bismuth powder, and bismuth alloys.

Through the implementation of the ROHS Directive, bismuth, as the best alternative to lead and chromium, is becoming more and more widely used in the fields of electronic packaging, coating, semiconductor, nuclear power, and sanitary ware.

And finally, we ended our tour in the high-security pharmaceutical plant, where bismuth powders – bismuth aluminate, bismuth potassium citrate, bismuth subnitrate and bismuth subcarbonate – are used in a range of medicines, in particular for the treatment of stomach and intestinal complaints. For obvious safety reasons, there are strict controls on entry into this area, as well as what clothing can be worn. Quality standards are government controlled to ensure compliance with human health regulations.



Lunch with the team

Following our fascinating tour of the Jinwang factory, our hosts very kindly invited Fan and myself to a wonderful lunch, where we were able to discuss the MMTA and how we can continue improving our support of our Chinese members.

The MMTA wishes to thank everyone at Jinwang for their time and their wonderful hospitality.



Jinwang hosted banquet

Brexit: In pursuit of clarity

By **Tamara Alliot**, MMTA

The British public has spoken and the long and winding road to leaving the EU has started.

Those at the helm have the challenge of steering the nation to a prosperous new future outside the confines of the EU while avoiding the many pitfalls. Whatever your personal feeling on the matter, the political, social and economic uncertainty that has been unleashed makes for truly interesting times.

At the end of November, MMTA member, Holman Fenwick Willan (HFW), put together an exceptional seminar asking for some 'clear thinking' on Brexit from an illustrious panel (with a mix of Breainers and Brexiteers represented) The discussion was chaired by Radio 4 'Today' programme presenter, **John Humphrys**.

The panel consisted of:

Ruth Lea—economic adviser and Director of the Arbuthnot Banking Group

The Right Honourable Jack Straw, Home and Foreign Secretary under Prime Minister Tony Blair

Anthony Woolich, Partner and Head of Competition and Regulation for HFW

Joshua Rozenburg QC, British legal commentator and journalist

Sir Paul Jenkins QC, formerly the UK Government's most senior legal official and the Permanent Secretary to the Attorney General

There were around 150 delegates in the room, comprised of lawyers, insurers, bankers and representatives of large UK companies, such as Virgin Atlantic and M&S.

Humphrys launched proceedings by asking the panel **'Where will we be in 2 ½ years?'**

(This timeframe being significant as the 2 years after the triggering of Article 50 will be completed and theoretically the UK could have left the EU by the then..

Ruth Lea believes that a 'hard' Brexit, (out of the customs union and the single market), will be completed by this point with regulatory equivalence established for financial services and other industries. Lea also predicts that the UK economy in 2019 will be the same as if there had been no Brexit.

Rozenburg, however, was not convinced that there would not be major delays brought about by the Supreme Court verdict (due in January) on whether Ministers can go ahead with Brexit or if a vote by MPs is required (which should, however, be in line with their constituents' views). Rozenburg's belief is that the major sticking point would be in the House of Lords where questions and clarifications could drastically slow the process of triggering Article 50 in the 'Spring' of 2017. Interestingly, a Member of the House of

Lords in the audience believed that there would not be any undue delay caused by the Lords.

Other pertinent points raised included the uncertain future of some European countries at the moment, with elections in France and Germany during 2017, and the change of the EU Parliament in Summer 2019.

The attitude of the European Parliament to the UK's decision should not be underestimated, which perhaps could encourage unnecessary delays and barriers. It does seem unlikely, however, that a General Election will be called in the UK before 2020, according to Jack Straw, so this is not likely to be a factor in delaying the process.

Humphrys' second question was simply **'What do we mean by 'go'?**

As a background note, during the campaign for the 'Leave' side, slogans such as 'taking back control' were used abundantly.

The government has been shy on their intentions according to Ruth Lea. During the last Conservative party conference, Theresa May said she wants to control immigration. This means that we would by default have to leave the EEA (European Economic Area). The 4 freedoms guaranteed by EU Membership are free movement of goods, freedom of movement for workers, right of establishment and freedom to provide services and free movement of capital. Only taking one part of the deal is not an option if May is serious about controlling immigration from EU countries.

Adding further weight to the argument, it was emphasised that the single market and the customs union are not the same thing, and that if we stayed in the EEA then the EU Court still has power, therefore staying in the EEA would be a very 'soft' Brexit indeed, and unlikely to go down well with Brexiteer voters.

It seems, however, that immigration is unlikely to be curbed in total numbers, but rather a non-discriminatory approach between EU and non-EU citizens established. Everyone will probably be required to apply for work visas on an even footing, but whether this is what the general public has in mind when they demand control of immigration from Brexit remains to be seen.

Another point from the panel is that there is unlikely to be a 'bonfire of regulations', as industries will need to stay compliant in order to access markets; rather, EU laws will be transferred into British laws.

Sir Paul described the situation as the biggest bureaucratic challenge in peace time, with the UK hugely dependant on things like Competition Law, as well as 140 EU institutions currently being referred to in domestic law.

Mr Straw saw a more pragmatic solution to the issue of laws. He used the example of former British colonies that have continued to use a base of British law for their own laws. A more copy and paste approach could save money and time he believes.

I admit that some of the debate on the legal basis of some laws and mention of Henry VIII clauses* was slightly over my head, but perhaps this just highlights the complexity of what the country is facing.

*see glossary

The third question posed to the panel was: '**Trump presidency: Good or bad?**'

After the inevitable witticisms, the Trump presidency was certainly not seen as negative in terms of Brexit and in establishing a potential trade deal with the US. There was confidence that positive relationships have already been forged between the Trump team and British diplomats.

Although the Trump presidency may not be worrying in this aspect, the audience member from the House of Lords brought a more sobering view that Trump's views and policies go far beyond trade and business and that his views on Iran, torture, climate change and NATO must not be forgotten. These, in his view, are the questions that matter most about Trump.

It was agreed that maintaining the intelligence relationship with the USA is of paramount importance for the future.

The panel members were also of the opinion that it may be easier to make trade deals with the US without the EU. TTIP (the proposed EU-USA trade deal) is probably already dead in the water.

Humphrys' then opened the floor to questions from the audience:

Hard Brexit looks certain. What about trans-national events? Climate change, war in the Middle East, African migration etc.

Trilateral agreements between the UK, France and Germany are key in this context. Within Europe, only the UK and France spend on defence, and Germany makes armaments. Therefore, separate agreements between these three countries will tackle transnational events.

It is important to note that due to the intelligence relationship between the US and UK, other EU countries will not want to lose this access through the UK.

What about transitional regulations?

We will probably end up with similar or identical regulations, but there will be uncertainty for the next 2 years (or 18 months as recent updates have indicated). The panel used aviation as an example; if there is no agreement or extension within the time limit then treaties will cease to exist and planes will not be able to fly between the UK and US. This seems like a 'scaremongering' scenario, but in this case insurers would not insure the planes to fly if no solution is found.

What about Scotland, Northern Ireland and Wales?

As we are in a union, the decision of the British parliament is final. The border between Northern Ireland and the Republic of Ireland must be kept open. It is not part of the Schengen zone so panellists were of the opinion that an additional agreement can be made to resolve this issue.

My general impression of the opinions expressed by the expert speakers was 'this is what's happening, so let's make the best of it'.

There was some sense of positivity, but the overall theme of uncertainty for a number years was prevalent. Some of the UK's most important trade partners have already approached and signalled their willingness to negotiate. One additional point to make is that there was no questioning of the legitimacy of the referendum from the panel. Everyone believed that the will of the British public should be followed whether for better or worse.

Glossary

European Economic area (EEA)– The European Economic Area is the area in which the Agreement on the EEA provides for the free movement of persons, goods, services and capital within the European Single Market. The EEA was established on 1 January 1994 upon entry into force of the EEA Agreement.

Customs Union– The European Union Customs Union is a customs union which consists of all the member states of the European Union, Monaco, and some territories of the United Kingdom which are not part of the EU. Some territories within the EU do not participate in the customs union, usually as a result of their geographic circumstances. Besides the EUCU, the EU, through separate agreements, is in customs unions with Andorra, San Marino, and Turkey, with the exceptions of certain goods

Single Market– The Single Market refers to the EU as one territory without any internal borders or other regulatory obstacles to the free movement of goods and services. A functioning Single Market stimulates competition and trade, improves efficiency, raises quality, and helps cut prices. The European Single Market is one of the EU's greatest achievements. It has fuelled economic growth and made the everyday life of European businesses and consumers easier.

European Parliament –The European Parliament is the directly elected parliamentary institution of the European Union. Together with the Council of the European Union and the European Commission, it exercises the legislative function of the EU. The Parliament is composed of 751 members, who represent the second largest democratic electorate in the world and the largest trans-national democratic electorate in the world.

European Commission –The European Commission is the executive body of the European Union responsible for proposing legislation, implementing decisions, upholding the EU treaties and managing the day-to-day business of the EU. Commissioners swear an oath at the European Court of Justice in Luxembourg, pledging to respect the treaties and to be completely independent in carrying out their duties during their mandate.

Henry VIII clauses–The Government sometimes adds this provision to a Bill to enable the Government to repeal or amend it after it has become an Act of Parliament. The provision enables primary legislation to be amended or repealed by subordinate legislation with or without further parliamentary scrutiny. Such provisions are known as Henry VIII clauses, so named from the Statute of Proclamations 1539 which gave King Henry VIII power to legislate by proclamation.

UPDATE: "Great Repeal Bill".

This is how the UK Government intends to convert EU law into British Law. However, not all EU environmental law can simply be copied in this manner, including REACH.

The Environmental Audit Committee ("EAC"), of the House of Commons has launched an inquiry on the future of Chemicals Regulation post-Brexit. It will focus on the future of REACH in the UK, and the impact of chemicals regulation on environmental protection, public safety and the UK's chemical industry. The future of REACH has huge implications for future trade with the EU.

The inquiry will consider the challenges to using the Great Repeal Bill to put REACH into UK law and the impact of Brexit negotiations, as well as how to transfer administration and enforcement from the European Chemicals Agency ("ECHA") to domestic bodies; the likely implications for industry in terms of regulatory, environmental and safety standards; and whether the UK Government has the expertise and resources to regulate REACH in the UK. It will also look at the scope for a UK chemicals regulation post-Brexit and its implications on the environment, public safety and UK industry.

Submissions are requested by **20 January 2017** and should be made here <http://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/inquiries/parliament-2015/inquiry2/commons-written-submission-form/>. Late submissions will be accepted by may be too late to inform the first oral evidence hearing.



METAL EVENTS'

REACH For The Metals Industry Forum
Radisson Blu Vanderbilt Hotel, London, UK
March 22 2017
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Metal Events is holding its **REACH For The Metals Industry Forum** in London on Wednesday 22 March 2017.

This one-day forum will tackle any last-minute questions you and your team may have as the deadline for REACH registration approaches in June 2018. Are you prepared? What do you need to do? How have things changed since 2010?

If you think REACH registration is too onerous for your company then don't miss out on this one-day seminar. It will provide you with information and tips on how to make sure your company is prepared.

The UK's vote to leave the EU also has major implications for REACH. The forum will focus on how BREXIT will affect REACH.

The one-day interactive forum aims to tackle the following topics:

- Are you ready for May 2018?
- What is the REACH road-map for 2018 and are you on it?
- What actions do you need to prepare by the deadline?
- How does the 2018 deadline apply to your company and what are the implications?
- How will BREXIT affect REACH in the UK? How will it affect your UK operations?
- What are the options for sole/small traders? How can you obtain letters of access?
- Orphan substances – how will this affect you? How do you get prepared?
- How will REACH affect downstream end users?
- What if raw materials disappear from the EU market? Do companies have replacements ready?
- What do companies do if they want to start manufacturing/importing a substance in the EEA for the first time after May 2018?
- Downstream users: who qualifies as a downstream user under REACH and what are their responsibilities and how REACH will affect them?

The expert presenters will be able to answer these and any other questions you may have during the interactive panel sessions.

We look forward to seeing you in London in March 2017

MMTA Joins the Non-Ferrous Alliance

The MMTA is delighted to announce that we have recently joined the Non-ferrous Alliance (NFA) as part of our goal to increase the MMTA's interconnectivity with relevant industry associations and networks. With its focus specifically on UK industry, the NFA has an important role, and it is especially important since the UK's recent vote to leave the EU. Through our NFA membership, the MMTA will be able to be at the heart of discussions between the UK Government and industry, not only for the benefit of UK members, but also to ensure that members across Europe and in other parts of the world are aware of how changes in the UK may impact their businesses.

These days companies are very focussed on keeping their business going on a commercially viable basis. Few have the free internal manpower and skills resources to keep a finger on the pulse of regulatory activity and to establish and maintain relationships with the many government agencies. It is essential for industry operators to understand and comply with changes in the regulatory activity that may affect their customers and hence the market.

Consultations

NFA regularly reviews consultations from DEFRA, Environment Agency, HSE, DECC (Department of Energy & Climate Change) and BIS (Business Industry & Skills) and generates responses to those consultations most relevant to the non-ferrous metals sector. Most recently, NFA contributed to the EU Non-Ferrous Metals BREF (Best Practice Reference Note and Best Available Technology).

Industry Trade Bodies

In addition to liaising with Eurometaux, the non-ferrous metals

industry body for the EU, NFA liaises with other UK industry trade bodies to establish common positions, where possible, in critical negotiations with DEFRA, Environment Agency, HSE and other Government bodies. NFA has contacts with Surface Engineering Association, Chemical Industry Association, Chemical Business Association, British Metals Recycling Association, British Coatings Federation and others on major issues.

On 'BREXIT'

The referendum decision of June 23rd 2016 taken up by the UK Government for the UK to leave the EU will very obviously change both the internal and external influences on the regulatory and commercial landscape. At this stage, it is impossible to predict accurately how these influences will affect industries in the UK. Government, through DEFRA and the other major agencies, are currently canvassing industry trade associations for input on 'BREXIT', in order to help guide the UK Government in developing its negotiating strategy. NFA has already been involved in a number of relevant meetings and workshops. It is understood that though the first steps may be across the board adoption of EU origin legislation in a UK legislative base, there is a clear opportunity to subsequently develop a more risk based system of regulatory control without compromising human health and the environment. NFA is already opening dialogue along these lines and working in conjunction with other trade associations.

NFA provides an effective focal point for the non-ferrous metals industry interests in the UK to be represented in Government interfaces, and the MMTA is delighted to be part of the alliance at this critical time of change.

IMPORT & EXPORT PROCEDURES COURSE

We are pleased to invite you and your colleagues to a two-day import/export training course on operational issues and procedures. We would ask you to forward this email to all others in your organisation with an interest in this area.

This course will cover the following:

Day One:

- The Import Chain
- Incoterms 2010
- Customs Formalities, including anti-dumping and tariffs
- Methods of Shipment
- Cargo Insurance
- Documentation
- Methods of payment

Day Two:

- Methods of payment cont.
- Letters of Credit

This two-day training course is jointly organised by ISTA (International Steel Trade Association) and the MMTA and will take place on **Thursday 16th March and Friday 17th March 2017** at the MMTA offices, Whitehall Court, London SW1A 2EL.

Jon Walden MBE [Crown Agents] will again be the course presenter. He will be making a reference to the possible consequences of Brexit on matters covered by the course.

The cost of this 2-day course will be £395 (+ vat where applicable).

Lunch will be provided on both days.

To book this event, contact gina@mmta.co.uk or go to www.mmta.co.uk/events

Braving the Elements

By **James Walsh**, MMTA

As minor metals have been further commercialised and exploited for their properties, metals technology has been enhanced greatly. High performance alloys, a general term for nickel-, cobalt-, iron- and titanium- based alloys, are used for protection against the most extreme environments.

Materials development across many industries has mainly been a result of economics, companies seeking to increase profits through making systems more efficient, pushing materials to greater limits and designing them to withstand harsher environments, be that higher temperatures, better resistance to corrosion or increasing strength-to-weight ratios where fuel economies are important, such as in transport.

Take power producing systems as an example of this technological evolution, where the performance has always been limited by the properties of materials and their interactions with the environment.

Since the early days of industrial steam generation in the seventeenth and eighteenth centuries the ever increasing need for power for new factories created a steady demand for larger boilers and increasingly severe steam conditions.

Materials selection was based on a limited knowledge of corrosion, especially stress corrosion cracking (SCC) as the consequence of chloride and oxygen contamination of the water used in boilers, and catastrophic failures of equipment occurred frequently.

As late as the end of the nineteenth century, hundreds of steam plant explosions accompanied by large numbers of casualties were being recorded every year in Europe and North America. The causes were generally linked to the failure of riveted joints or poorly worked steel plate. The major consequence of these failures led to the development of codes and standards for pressure retaining components. Today the risk of catastrophic failure for any industry is low and can be attributed to the strict adherence to standards imposed on component designers and manufacturers.

Here, I have selected just a handful of applications to illustrate how minor metals have furthered technology development.

Single Crystal Turbine Blades

The aerospace industry has existed for less than 100 years, but its development and growth has been generated by innovative companies and clever academics being able to push materials to higher limits allowing engines to run hotter, fly higher and stay in the air for longer.

Jet engine turbine blades need to be extremely durable to withstand the punishment they receive during operation of the engine. Along with the massive mechanical loads they experience,

they need to withstand extremely high temperatures. Needless to say, failure of such a part in an aircraft could be catastrophic. This turbine blade has two distinguishing material features.

Firstly, it is made of a superalloy, which has superior mechanical strength and creep resistance at high temperatures, good corrosion and oxidation resistance compared to normal metals and alloys. Secondly, it is formed out of a single metal crystal, a structure which gives the blade outstanding strength at high temperatures.

Most bulk metals are not one big crystal: they are composed of many tiny crystallites called grains. The boundaries between these grains generally increase the strength of a metal, however at high temperatures they provide a way for the metal to deform over time (called creep).

Creating a turbine blade as a single crystal means it does not have any grain boundaries, and it is therefore intrinsically stronger at high temperatures than polycrystalline metals. It is this property that has allowed turbine jet engines to be operated reliably at very high temperatures which increases the efficiency and safety of the engine.

One minor metal added to these superalloys is rhenium, amounting to around 6.0wt% in third generation single-crystal nickel based superalloys, leading to an improvement in the creep strength and fatigue resistance.

Newer generations of single-crystal superalloys (4th, 5th and 6th) have been developed which also contain ruthenium additions of up to 5.0wt%. The addition of Ru has been one of the main subjects of focus to enhance temperature capability and contribute to the development of new generations of single-crystal superalloys, however, 4th and 5th gen superalloys with higher contents of refractories, such as Mo, Re and Ru are likely to have lower resistance against oxidation than previous generations.



In the last few years, a new wave of superalloys have addressed this issue and include TMS-238, a 6th gen superalloy, which exhibits both high-temperature creep strength and improved oxidation resistance.

Nuclear Reactors

For materials used in the core of a nuclear reactor, it is important that they have specific properties such as low neutron absorption and high resistance to radiation-induced creep and the associated loss of ductility so that reactors can operate for the decades expected by operators.

Nuclear materials must be selected or specified based upon their strength and interactions with the environment, including the effects of radiation, all of which are dependent upon the metallurgy of the material.

Zirconium is the eleventh most abundant element in the earth's crust making it more prevalent than the common transition metals copper, lead, nickel and zinc. It occurs naturally as the minerals zircon (zirconium silicate – $ZrSiO_4$) and zirconia (zirconium oxide – ZrO_2) and usually contains about 0.5 – 2.5% hafnium (Hf), a metal that has very similar chemical and physical properties making it



difficult to separate the two elements.

Zirconium or more specifically, the alloys fabricated from it are some of the most important of the nuclear reactor materials. They are resistant to corrosion in many process environments, nuclear heat transport systems in particular, and they have excellent nuclear properties making them the predominant materials for construction of in-core components, for example, fuel rods and pressure tubes.

Zirconium itself has a neutron absorption cross-section of 0.18 barns, making it nearly transparent to the thermal neutrons in a water-cooled and -moderated reactor. Zirconium alloys used in nuclear reactors must be highly processed to keep the hafnium concentration below 100 ppm since the neutron absorption cross-section of hafnium is 102 barns, nearly 600 times that of zirconium.

The pure metal is alloyed with small amounts of elements such as tin, chromium, iron, nickel and niobium to improve mechanical strength, corrosion resistance and to reduce hydrogen pickup.



Sub-sea (oil and gas)

Corrosion Resistant Alloys are essential for providing long term resistance to corrosion for many components exposed to oil and gas production environments. Components include downhole tubing and safety critical elements, pipelines and piping, heat exchangers and many other pieces of equipment in facilities.

There are many CRAs to select from, and they can be characterised by their resistance to specific environments. Key environmental parameters influencing the corrosion properties of CRAs are: temperature; chloride ion concentration; environment pH and H_2S .

Between them these parameters influence: the stability of passive film (initiation of pitting or general corrosion); ease of repassivation of initiated pits; rates of dissolution of metal from pits; the risk of Stress Corrosion Cracking (SCC) initiating and propagating.

The selection of Corrosion Resistant Alloys, CRAs, for producing and transporting corrosive oil and gas can be a complex procedure and if improperly undertaken can lead to mistakes in application and misunderstanding about the performance of a CRA in a specific service environment. There are international standards such as ISO 15156 and NACE (National Association of Corrosion Engineers) 0175 used for materials selection in corrosive environments.

A variety of steel and nickel based alloys exist to cater for the different combination of environments with Cr and Mo the major constituents ranging from 10-30 wt% for Cr and 1-16 wt% for Mo. Other minor metals added in smaller quantities include Mn, Ti, Nb and W.

A common nickel based alloy, C-276 developed by Haynes has had over 50 years of proven performance in a wide range of aggressive chemicals. It was also the first wrought, nickel-chromium-molybdenum material to alleviate concerns over welding – by virtue of very low silicon and carbon additions.

Sources: <https://www.theengineer.co.uk/issues/june-2015-online/jewel-in-the-crown-rolls-royces-single-crystal-turbine-blade-casting-foundry/>

<http://www.nuceng.ca/candu/pdf/14%20-%20Nuclear%20Plant%20Materials%20and%20Corrosion.pdf>

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