

## NASA's Juno spacecraft arrives at Jupiter — made possible by tantalum and niobium (p. 24)

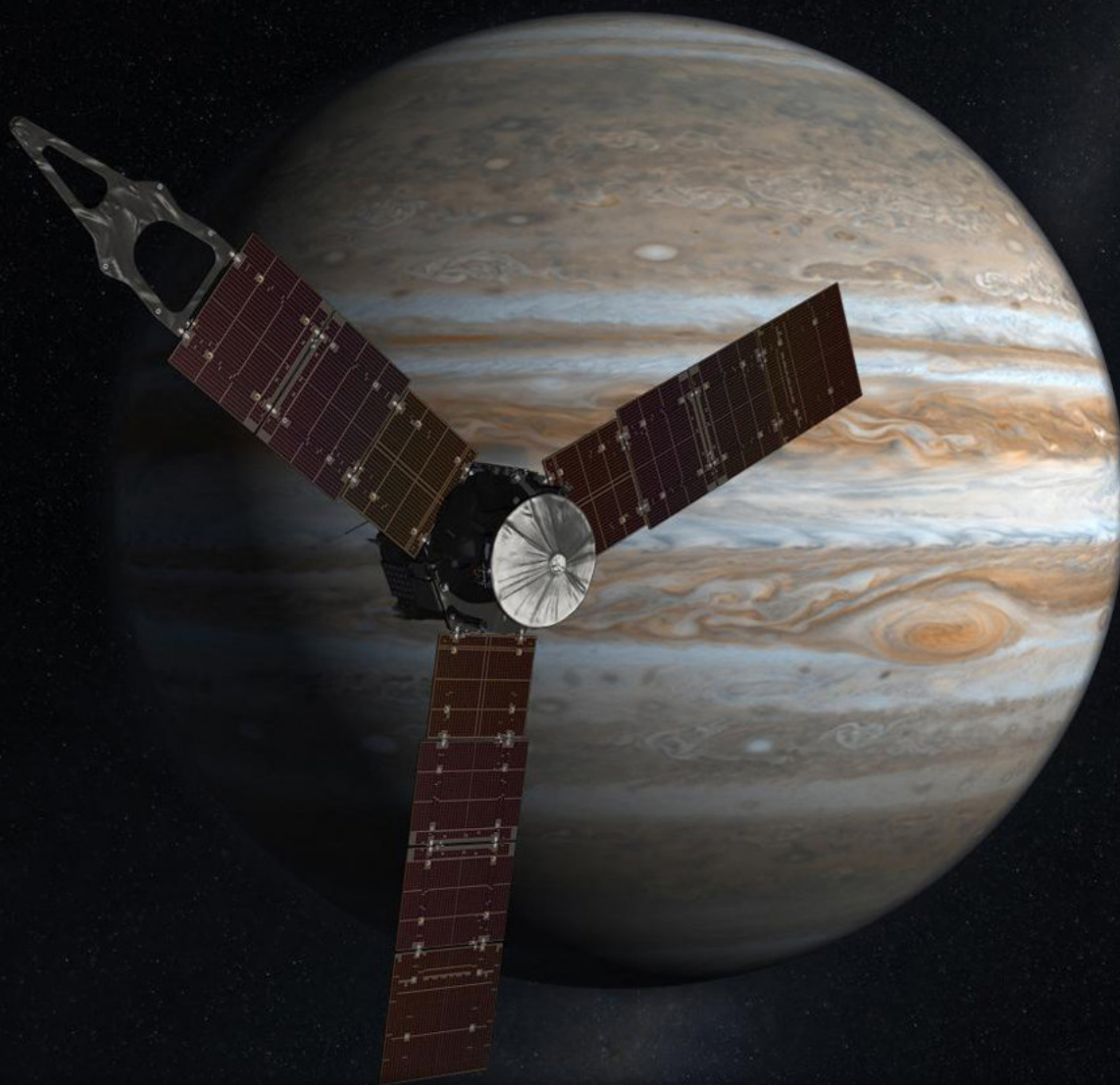


Image credits: NASA/JPL-Caltech

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## President's Letter

Dear Fellow Members and Friends,

I trust this finds all of you enjoying your summer, as the weather has been glorious here in New England?

These are clearly interesting times for both tantalum and niobium.

Your Executive Committee has been hard at work seeking to improve the organization and to provide our members value for money. First, as you will see this Fall and well in time to vote on in Toulouse, we are budgeting to run a substantial deficit this financial year to fund the investments we are making in the T.I.C. However, given our funds on hand, the Executive Committee has decided to leave annual corporate dues as they are, at Euros 2,400/year.

I believe we have made significant strides in getting better, but there is more to be done. The addition of Roland Chavasse, as our first Director, is bearing fruit - whether this is with improved relations with ITRI/iTSCi and other organizations we deal with or with the many other initiatives underway. In case you have not yet heard personally from Roland, please rest assured he will be contacting you imminently. I would like to establish a new tradition in this Quarterly Bulletin, with a letter from the Director as well.

On a related note, I am delighted to inform our members that we are close to finalizing the hiring of a new Technical Officer and hope to announce more details to you in the coming weeks. Given the growing technical complexity of our industries, no one individual has the bandwidth to answer any and all scientific questions immediately. However, given enough experience and expertise and the ability to network to understand your concerns, we see a major component of this revised role as being more responsive and more proactive to your questions.

On a related note, during this past quarter, we have seen increasing issues about denial of shipment and transport of radioactive materials, particularly in ore shipments from east Africa. T.I.C. staff are working diligently on this. Although you approved our transport of radioactive materials policy in New York in October 2014, where you agreed to follow all applicable laws and regulations, we believe the membership desires better information and education on this subject and we've planned to address this over the next weeks and months.

As you know, we've established various sub-teams during my tenure, including Meetings (headed by David Gussack), Statistics (headed by Alexey Tsorayev), Supply Chain (led by John Crawley), Staffing (with Bill Millman at the helm), and Marketing (chaired by Ian Margerison). We're seeking to get more volunteers serving on such, so your thoughts and comments would be sincerely appreciated please. Brief updates on these initiatives will be provided during the General Assembly in Toulouse. In addition, we have others outside the T.I.C. per se, such as a Ta smelter definition sub-team, headed by Leah Butler of the EICC/CFSI and on which some T.I.C. members serve (more details on that will be presented at the General Assembly).

In the coming weeks, you will also be receiving communications on planned changes to the organization, where your vote in Toulouse is both sought and important. As previously mentioned, and listed on our website, for example, we hope to adopt an anti-trust policy there. We also will be updating our Charter, if we secure your agreement, on such issues as moving our fiscal year to a calendar year, moving from snail mail into the electronic age, staffing, etc (see page 3).

I would urge our members and friends, in case they have not already done so, to promptly register for Toulouse, particularly as space is somewhat limited at both the Radisson Blu hotel and for the special tour of Airbus's facility. Early returns have demonstrated that the plant tour has attracted the highest ever participation rates from individuals. While I believe we have arranged a very interesting and balanced presentation schedule (in fact, some volunteers had to be turned away, due to lack of space), we also recognize that the General Assembly is an unparalleled time for networking.

Finally, I would again like to express my sincere appreciation to two members of our Executive Committee who will be stepping down in Toulouse: Dale Gwinnutt and Bill Millman. Their commitment to the T.I.C. and their contributions and insights will definitely be missed. You will get a better flavor of Dale's perspectives in this issue, while an interview with Bill is planned for the Fall Bulletin. Given these pending vacancies, while a few of you have already expressed an interest in standing for election to the Executive Committee, I would ask any of you who seek to improve the organization to please put your name forward as a potential candidate. We are all in this together!

Best regards,

David Henderson

President

## Director's Letter

Dear T.I.C. Members,

It has been a little over six months since the Executive Committee appointed me as T.I.C.'s Director and the time has flown by rapidly. Having *'jumped in at the deep end'*, as we say here in England, things are now gradually settling down. Thank you for your messages of support and advice, which were most welcome.

Our Association is travelling through a period of considerable change at present; a new website and branding, new staff, a new statistics collection system, and a revised Charter too. This is part of a concerted strategy for the growth and long-term prosperity of the T.I.C., on which I will elaborate more in future Bulletins and at the General Assembly in Toulouse.

The T.I.C. faces several challenges in the foreseeable future. Some are linked to events in the tantalum and niobium markets, others are more structural in nature and relate to how the Association can best use its resources to represent and support its members. The increasing requirements of due diligence are perhaps the most demanding challenge we currently face, and in just the last few months new guidance has been published in China and new legislation agreed by the European Union. The President, Executive Committee and I, together with the sub-teams, Emma Wickens and our new Technical Officer, will continue to monitor the T.I.C.'s external environment and work with relevant stakeholders on due diligence and other relevant matters.

But while there are undeniably challenges ahead, we also have a very powerful, positive story to share with the world, one that concerns two of the greatest elements in the periodic table.

I know this because six months ago my six year old daughter asked me what I did in my new job. We were sitting in a café in central London and as we looked out of the window on to the busy street I started explaining to her how niobium and tantalum were used in the things we could see: construction steel in a new office block, automobile steel in cars, computers, phones, an aircraft flying overhead. I was about to start telling her about medical implants, satellites, maglev trains and the Large Hadron Collider when she turned to me and said "So, without them things would be a bit rubbish". I had to agree.

I am greatly looking forward to meeting many of you in person in Toulouse. Always feel free to contact me.

Best wishes,

Roland Chavasse

## A timely update to the T.I.C. Charter

The T.I.C.'s Charter is at the heart of this Association, establishing our existence, setting out our purpose and describing the rules for membership, and much else; but it is also a living document and as such it evolves to reflect the changing requirements of its membership and the world in which they live.

The Charter has been updated 10 times since the T.I.C. was established in 1974, most recently in 2008. Each update was made in the best interests of the Association and was relevant at the time; but relevance fades after a while and it is time for the Charter to be updated once again.

The new updates proposed by the Executive Committee and a copy of the 2008 Charter will be circulated to the membership shortly, in readiness for their vote at the General Assembly.

The key updates are as follows:

- Removing "facsimile" (fax) from the list of forms of official communications, leaving letter and email.
- Move the financial year from July-June to January-December.
- Clarify the two membership categories: corporate and associate. Associate membership is only available to not-for-profit organisations. Associates can't vote, join the Executive Committee or receive statistics.
- Changing the name of the main annual members' meeting from "General Assembly" to "Annual General Meeting" (AGM). Henceforth the term "General Assembly" would refer to the annual T.I.C. event that includes both the AGM and the technical conference, in common with colloquial use by members.

Please consider the full document in due course and share your feedback with the T.I.C. **TIC**

### CO-ORDINATED TEXT OF THE CHARTER OF TANTALUM-NIOBIUM INTERNATIONAL STUDY CENTER – 'T.I.C.'

International Association  
established in Brussels  
according to the Belgian law of June 27th 1921 and  
authorised by Royal Ordinance of August 6th 1974  
(*Moniteur Belge*, October 24th 1974, No. 7311)  
of which the charter was modified by the  
General Meetings  
of September 18th 1975, October 29th 1979,  
October 26th 1982, May 24th 1983, June 5th 1984, May 20th 1986, October 20th 1987,  
November 17th 1992, October 11th 2004, October 20th 2008



## A letter from the T.I.C. Statistics Sub-team

Dear T.I.C. Members,

Greetings from a new Executive Committee sub-team devoted to the T.I.C.'s statistics and their improvement.

Being a Head of Tantalum processing operations I dream about having authentic statistics as free from distortion and double counting as possible in order to gain a clearer understanding of the market, its processes and trends, to identify its weak points and potential development directions as well as investment ways, particularly during hard times for our industry.

This is the time to change the approach to our statistics preparation by means of expanding designation of product groups and changing their content to get more reliable and accurate information. It is still true what Nathan Rothschild said in the 19th century - "He who owns the information, owns the world".

The voice of one man is the voice of no one, as the old proverb states, and indeed reliable statistics cannot be achieved by the efforts of only several companies. Each of you, T.I.C. members, is tasked to make a contribution to statistics preparation. In particular you can help us in implementing our goal by providing your data regularly and truthfully, and in full confidence of the data security of the new Statistics Collection Website (see below). It is our goal that in due course the statistics reports will become a main advantage of T.I.C. membership, but I am sure you know that major starts with minor!

Sincerely Yours,

Alexey Tsorayev, Ulba/Kazatomprom



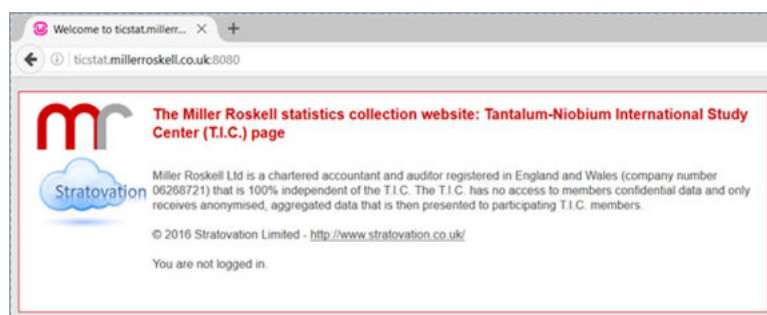
Alexey Tsorayev, Chair of the T.I.C. Statistics Subteam

## T.I.C.'s Statistics Collection Website: A secure new way to report your data

Since the start of this year the T.I.C. has invested in a highly secure Statistics Collection Website, an online database to collect the quarterly members' trade data (see Bulletin #165). The site is at <http://ticstat.millerroskell.co.uk:8080/> and is already receiving data for the 2016-Q2 collection period.

For 2016-Q2 members may report their data using either the new online system or the old emailed forms, however 2016-Q3 onwards data will only be accepted through the online database.

If members have any questions or would like a copy of the user guide, including detailed description of its security features, please contact [director@tanb.org](mailto:director@tanb.org).



T.I.C. Director Roland Chavasse with David Miller of Miller Roskell.

### Data security and confidentiality

The privacy and security of your data is our utmost priority and is central to the design and function of the Statistics Collection Website.

Members' trade data is only seen by the senior partner at Miller Roskell, Mr David Miller FCCA. The T.I.C. has no access to see members' data. The T.I.C. receives the aggregated, anonymised data that it shares with members.

Miller Roskell Ltd is the 100% independent chartered certified accountant that has collected members' statistics since 2015. It is a member of the Association of Chartered Certified Accountants, is ruled by their client confidentiality rules. Their website is [www.millerroskell.co.uk](http://www.millerroskell.co.uk). The Statistics Collection Website is hosted and stored encrypted on Miller Roskell's computer network. **TIC**

## China launches initiative on tackling conflict minerals

*A new Chinese industry initiative embarks on supporting Chinese companies in the tin and tantalum (and other minerals) industry to improve due diligence of their global supply chains in order to prevent that they are involved in human rights abuses, armed conflict, or causing significant environmental or societal damage. This article has been written for the T.I.C. by Jannick Saegert, Consultant, Responsible Business Conduct.*

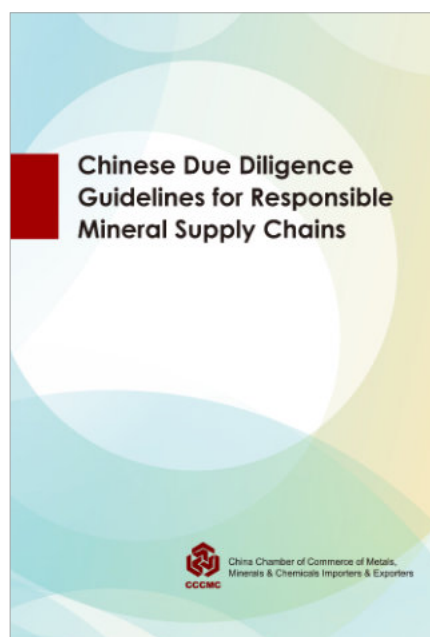
In December 2015, the Chinese Chamber of Commerce for Minerals, Metals and Chemicals Importers and Exporters (CCCMC) published the *Guidelines for Responsible Mineral Supply Chains* (available in [Chinese](#)<sup>1</sup>, [English](#)<sup>2</sup> and [French](#)<sup>3</sup>).



**中国五矿化工进出口商会**

China Chamber of Commerce of Metals,  
Minerals & Chemicals Importers & Exporters

The Chinese Guidelines are based on the OECD *Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-affected and High-risk Areas* ('OECD Guidance') and establish a due diligence framework that lives up to international standards and incorporates Chinese characteristics. After the launch in Beijing, the Chinese Guidelines were presented to a wider international audience at the 10th OECD-ICGLR-UN GoE Forum on Responsible Mineral Supply Chains in Paris (for a report from this forum see page 10).



At the heart of the framework of the Chinese Guidelines are the five steps for risk-based supply chain due diligence based on the OECD Guidance. The Chinese Guidelines further share with the OECD Guidance its global geographic scope and the call for a third-party audit of companies at identified choke points in the mineral supply chains. For the tantalum and tin industries those choke points are smelters and refiners. While initially focusing on the 3T+G materials (tin, tantalum, tungsten and gold), CCCMC has already taken steps to engage in the global cobalt supply chain and is planning to further broaden the mineral scope.

The most notable difference of the Chinese Guidelines to the OECD Guidance is the introduction of so-called *Type 2* risks which are additional risks associated with serious misconduct in environmental, social and ethical issues. The geographical focus is consequently much broader than "conflict-affected and high-risk areas" in the Great Lakes Region of Africa, as, for example, stipulated in the Dodd-Frank Act. Every company that is covered by the scope of the Chinese Guidelines is expected to conduct risk-based due diligence regardless where they source from. This also accounts for Chinese companies that only mine in or source from China.

The implementation of the Guidelines as such is voluntary. However, as an industry association, the objective of CCCMC is to support all companies in the tin and tantalum and other mineral supply chains, not only smelters and refiners, to support their continuous improvement with regard to human rights, and their environmental, social and ethical impacts in mining areas and along transportation routes.

The Chinese Guidelines recognize that there are existing international industry initiatives in the tin, tantalum, tungsten and gold industries which have been designed for similar purposes. Initiatives such as the iTSCI Programme, the Conflict-Free Sourcing Initiative and the Responsible Gold Guidance of the London Bullion Market Association and others have already successfully engaged with Chinese smelters and refiners. CCCMC is engaging and working closely with existing initiatives to avoid unnecessary multiplying of requirements for Chinese smelters, refiners and other companies in the mineral supply chains.

The initiative is a joint project between the OECD and CCCMC and is derived from the *Vision for Medium Term and a Programme of Work for 2015-2016* between the OECD and the Chinese government signed by Secretary-General Angel Gurría and Minister of Commerce GAO Hucheng during the visit of Prime Minister LI Keqiang at the OECD Headquarters.

CCCMC is a subordinate unit of the Ministry of Commerce of China and is an industrial membership institution with more than 6,000 companies from the Chinese minerals, metals, and chemicals industries.

For further information, please contact [rbc@cccmc.org.cn](mailto:rbc@cccmc.org.cn) or visit CCCMC online at <http://www.cccmc.org.cn>

1 - Chinese <http://www.cccmc.org.cn/docs/2016-05/20160503161454495880.pdf>

2 - English <http://www.cccmc.org.cn/docs/2016-05/20160503161408153738.pdf>

3 - French <http://www.cccmc.org.cn/docs/2016-05/20160504131324546514.pdf>

## Making a difference

*Dale Gwinnutt of Elite Material Solutions Limited reflects on his time on the T.I.C. Executive Committee.*

As a long-time member of the T.I.C., the Association has afforded me the opportunity to meet people from all levels in our industry; sometimes relevant to my sector, sometimes not. But the T.I.C. always gave me the opportunity to learn more about the industry and so become more effective in my business.



Dale Gwinnutt (4th from right) visiting Mr Jiang Kun Lin, President of Changsha South Tantalum Niobium Co Ltd, and his team.

In 2013 in York I had the opportunity to stand for the Executive Committee and was fortunate enough to be voted in. It has been a great opportunity not only to learn more about our fascinating industry, but also to put something back by working on sub-teams to achieve results that benefit all members.

**Why bother?** Like all members I received my Bulletin and once a year had the opportunity to go to nice hotels and meet up with old friends. So why take on more work that I was not being paid for, and put more pressure on my valuable time?

The answer is simple, I believe that almost all of the members in the T.I.C. enjoy this industry, some even revel in this industry, talking of nothing

else! The Executive Committee gave me the opportunity to see the industry as a whole, to have an input into decisions that could grow the use of Tantalum and Niobium, by developing new uses and markets. It gave me the chance to get an insight into other sectors and try to develop new ideas for the benefit of the members. By taking part it meant I had a say and more importantly could put forward ideas.

**Does it work?** The T.I.C. has changed over the last 5 years, and we have a new Director, a new web site that is still developing, and the development of sub-teams focusing on things that hopefully matter to the members. Going forward there is a purpose and drive to bring new people onto the Executive Committee with new skills and new ideas. There is an exciting feel to the Committee that welcomes change and free flow of people coming onto the Committee and doing something specific.

What is now needed is the membership to become more involved. So apply to go on the Committee or a sub-team, it's not for life but it will make a positive difference to our industry. It's an opportunity and experience that members should not miss.

**I'll be back.** This year I am standing down due to increased business commitments, but have every intention that, when I can guarantee I have the time to commit and have ideas to put forward, I will be applying to go back on and hopefully will serve again. We have new and exciting people recently voted on and it would be great to see many more applications, adding new ideas each year.

**Finally,** I thank everyone on the Executive Committee for a really exciting and rewarding experience. These people give their time and experience and as a team there is a real feeling of making the industry the best it can be. A team spirit where everyone is heard and hard work is appreciated.

A special thanks to our President Mr David Henderson, a pleasure working with you, and to our senior Executive Committee members who advised and assisted my integration without complaint (I hope?). And to Mr Bill Millman, one of the hardest working and longest serving members, thank you for all the help, a gentleman that will be very sorely missed when he steps down in October.



Dale.



## European Union (EU) reaches agreement on conflict mineral legislation

On 16th June the European Union (EU) announced that agreement had been reached on the broad framework of a conflict minerals regulation between the EU's Parliament, Council and Commission, its three main institutions (see Bulletin [#165](#)).

The technical details still need to be worked out, but key agreements include:

- All but the smallest EU firms importing, smelting or refining tin, tungsten, tantalum, gold (3T+G) and their ores shall undertake mandatory due diligence checks on their suppliers. The EU Commission and Council had initially proposed only voluntary checks.
- Recycled metals, existing EU stocks and by-products are excluded from the regulation.
- The EU will press big manufacturers to disclose details of products that might contain 3T+G.

Due diligence will follow OECD's due diligence guidelines and will be mandatory for importers of 3T+G from conflict and high-risk areas, as defined by the EU Commission in a forthcoming "Handbook for the operators". Individual companies are responsible for their due diligence efforts, in particular to matching the level of due diligence to the risks in their supply chain.

In a press release the European Parliament said<sup>1</sup> that "EU member states' competent authorities will be responsible for ensuring compliance by companies, and also for determining penalties for non-compliance, to be monitored by the EU Commission". As was mentioned in the last Bulletin ([#165](#)) representatives from EU institutions are aware that both the T.I.C. and the wider tantalum industry has already demonstrated considerable leadership in due diligence and conflict-free auditing. The T.I.C. will continue to follow this matter closely. **TIC**

1 - <http://www.europarl.europa.eu/news/en/news-room/20160615IPR32320/Conflict-minerals-MEPs-secure-mandatory-due-diligence-for-importers>

Image by Wikicommons as linked



## USA questions China's export duties on tantalum and 8 other materials



At the start of July the US Trade Representative Ambassador Michael Froman announced that the United States had launched a new trade enforcement action against the People's Republic of China at the World Trade Organization (WTO) concerning China's export duties on nine different raw materials.



The central allegation is that when China joined the WTO it agreed to eliminate its export duties on these products, but it has failed to follow through on this commitment. China joined the WTO in December 2001 and since that time the Americans have made several trade enforcement cases, including 13 under the administration of President Obama.

The nine raw materials specified in the latest trade dispute are antimony, cobalt, copper, graphite, lead, magnesia, talc, tantalum, and tin. The US claims that the export duties China imposes on these materials provide substantial competitive advantages for Chinese manufacturers by lowering the prices paid by China's manufacturers that use the raw materials while simultaneously making them more expensive for U.S. manufacturers that rely on these raw materials to produce their downstream goods.

Reacting to the case China's Commerce Ministry expressed regret at the decision, but said it would handle it according to the WTO dispute resolution process. China's export duties have been imposed in the face of "daily worsening pressure on resources and the environment" and are to help with sustainable development. "They are a part of overall measures to strengthen environmental protection and accord with WTO rules," it said.

According to the Metal-Pages website<sup>1</sup> the export tariff from China for tantalum-niobium ore and concentrate is 30% (HS codes 26159090 and 26159010) and for tantalum scrap is 10% (HS code 81033000). **TIC**

1 - <http://www.metal-pages.com/resources/chinese-export-tariffs/>

Images by Wikicommons as linked.

## A visual guide to artisanal and small-scale mining (ASM) of tantalite

In 2013 and 2014 Ulric Schwela, T.I.C.'s then Technical Officer, visited various ASM mine sites in Burundi, DRC and Rwanda as part of his role of the T.I.C.'s representative on the Governance Committee of the iTSCi Programme. This selection of photographs shows typical tantalite ASM processes, although in reality operations vary considerably according to local conditions and resources. All photos are credited to Ulric Schwela.



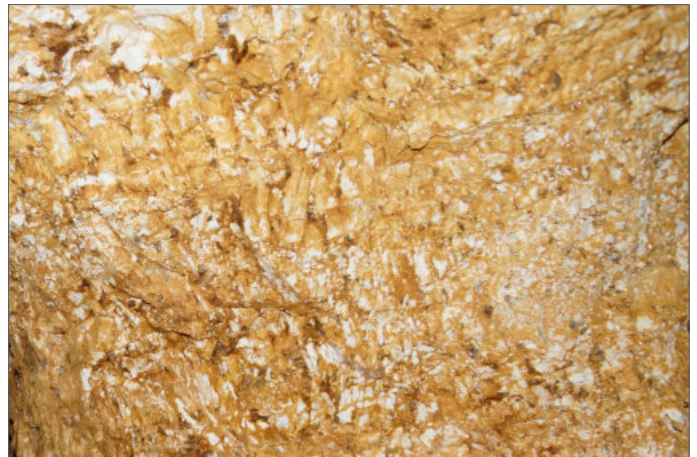
A typical hillside mine. Most ASM mines in central Africa are without straightforward access, in some cases an entire day's walk from the nearest road.



Entrance to a hillside artisanal mine, here protected from falling rocks by a basic shelter.



Clambering along a horizontal shaft; mines can go in any which direction, including vertical shafts.



In artisanal mines hand tools (hammers and chisels) are used to extract the rock.



The tantalite (or columbo-tantalite) forms small, dark inclusions within the soft pegmatite host rock.



The extracted ore is typically a sandy gravel. Larger pieces are crushed manually or mechanically .





The mined ore is washed in stages to concentrate the relatively heavy fractions of tantalite.



The first wash is often relatively crude. Plentiful and/or well-managed supplies of washing water is a critical factor for ASM operations.



Subsequent stages might include manual washing tables (shown here) or mechanised gravity jigging tables.



The material recovered from washing is a fine, dark-grey material that will contain 20-40%  $\text{Ta}_2\text{O}_5$ .



The concentrate is heated and dried to remove all moisture.

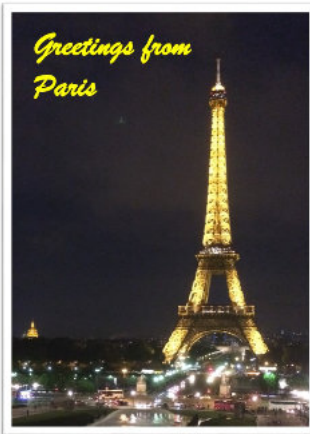


Once the dry concentrate is bagged and weighed, it is tagged and logged ready for sale to a local trader (*comptoir*) who will combine it into a larger blended lot for export to a processor/smelter.

For further information about ASM and the T.I.C.'s ASM policy please visit <http://www.tanb.org/view/supply-chain-->. The T.I.C. is currently reviewing its ASM policy (written in 2009) and if you have any suggestions please contact the Association using [info@tanb.org](mailto:info@tanb.org). **TIC**



## Postcard from the OECD's forum in Paris, France



In recent years Paris in May has become closely associated with the OECD's annual forums on Responsible Mineral Supply Chains, at least for the T.I.C. and other stakeholders in tantalite, wolframite, cassiterite (the '3T' minerals) and gold and 2016 was no exception. The T.I.C. attended, as did several members of the Association.

This year the forum focused primarily on compliance and implementation of the OECD Due Diligence Guidance, now in its 3rd edition<sup>1</sup>. The key clarification made to the guidance in the 3rd edition is the explicit confirmation that the guidance provides a framework for detailed due diligence for all minerals and not just 3T minerals and gold.

The forum also discussed the ICGLR Regional Certification Mechanism and other initiatives to enable responsible mineral supply chains in detail.

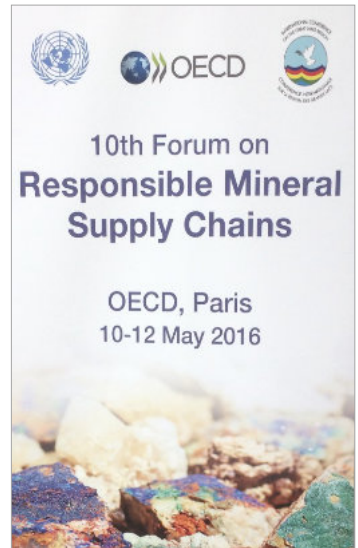
Key themes from the forum included maximising the positive impacts on livelihoods through due diligence, cost-effectiveness of due diligence processes in light of declining commodity prices, and ways to identify and prevent the worst forms of child labour (as defined by Article 3 of ILO Convention No. 182).

The iTSCi Programme (the T.I.C. sits on the iTSCi Governance Committee) was singled out for praise from the OECD<sup>2</sup> who stated it had "made remarkable progress and is the only on-the-ground traceability and due diligence programme that has to date been able to demonstrate a clear impact on mineral production and exports".

The tantalum industry was also highly commended, this time by the Conflict-Free Sourcing Initiative (CFSI), who credited the tantalum industry as being the only 3T mineral whose smelters currently have a 100% participation rate with CFSI's Conflict-Free Smelter Program.

Through the hard work and perseverance of those involved in tantalum and other 3Ts industries, combined with the success of iTSCi and other due diligence programmes, the OECD's guidance is steadily being translated into workable processes in central Africa; processes which act to break the link between 3T mineral production and conflict.

This doesn't mean the OECD's work is over; during the forum several stakeholders described how an unintended



consequence of 3T minerals becoming successfully regulated and legitimised is that illegal mining activities in the Great Lakes Region have almost entirely transitioned from 3T minerals to focus instead on gold and coloured (gem) stones, commodities with barely developed in-region traceability schemes.

The annual forum is jointly organised by the OECD, the International Conference on the Great Lakes Region (ICGLR) and the UN Group of Experts on the DRC. **TIC**



Attendees of the PPA alignment meeting at the OECD, Paris, 13th May 2016, abutting the OECD's 10th Forum on Responsible Mineral Supply Chains. Roland Chavasse, T.I.C. Director, is sixth from left (photo: RESOLVE).

1 - The 3rd edition of the OECD's due diligence guidance can be downloaded from <http://www.oecd.org/corporate/mne/mining.htm>

2 - The OECD's report can be read at [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=COM/DAF/INV/DCD/DAC\(2015\)3/FINAL&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=COM/DAF/INV/DCD/DAC(2015)3/FINAL&docLanguage=En)



The following papers are expected. The announced presenter is the first author listed, unless otherwise specified. The papers are shown in alphabetical order of first author (not in running order).

### **A downstream customer's dependence on conflict free tantalum**

by Mark Alexander, Plantronics Inc.

Non-Governmental Organizations and consumers have recently focused on socioeconomic issues in the global supply chains. The most visible of these concerns has been on funding of conflict through natural resource extraction, in particular the mining of tin, tantalum, tungsten and gold in the Democratic Republic of Congo (DRC). The resultant US conflict minerals legislation and SEC implementation rules caused companies to examine where materials are used within their supply chain in order to determine if the metals in their products have contributed to the funding of this conflict. Our survey of our supply chain revealed more tantalum use than we expected. Nearly one third of our supply chain provided products or components containing tantalum, and thirty-four distinct tantalum processors were reported in our supply chain, eight of them occurring more than 10 times. Public facing public companies that, in many cases, are both far removed from mineral extraction and processing, and resource limited, need to determine the conflict free status of all of the minerals.

Companies therefore work through downstream industry associations to implement validation of conflict free sourcing. The co-operation of the companies closer to the sourcing of the minerals, i.e. smelters and refiners, is key in developing and validating a conflict free supply chain, and at the same time, not creating a de-facto embargo of minerals from central Africa. The participation of industry organizations such as T.I.C. and the influence on their members has proven to be one of the most effective ways of achieving these goals. Global legislation is now expanding the scope beyond conflict in the DRC. The expansion is geographical, other minerals, social issues like forced and child labor, and environmental issues. Continued cooperative efforts between downstream companies and organizations and upstream processors will be even more critical to addressing these issues.

### **Conflict Free Smelter Programme tantalum industry briefing**

by Leah Butler, Conflict Free Sourcing Initiative (CFSI)

This presentation will open with a report on the Conflict Free Sourcing Initiative's progress to date in supporting conflict-free supply chains for tin, tantalum, gold, and tungsten (3TG). It will include the latest updates and status of the Conflict Free Smelter Program participation by 3TG smelters and refiners. The presentation will then provide an overview of program highlights over the past year and will survey current activities and developments, specifically focusing on the 2016 tantalum/tin protocol revisions. The revised protocol brings the CFSP's independent third party audit of smelters and refiners into full alignment with the OECD *Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*. These revisions also include clarifications to audit eligibility and company types, as informed by input from CFSI's Tantalum Sub-Team.

### **New due diligence models for conducting right sized, cost efficient, responsible sourcing of the 3Ts plus gold**

by Benjamin Clair (Better Sourcing Program) and William Millman (AVX Corporation) (presented by Benjamin Clair and William Millman)

With the end of another commodity bubble, and subsequent collapse in global mineral pricing, financial challenges around conducting appropriate due diligence, in conflict affected countries of weak governance, grows even greater. Developing sustainable models of due diligence is imperative for industry to maintain and grow responsible engagement in-region. A move away from 'one size fits all' models, toward more flexible, responsive and cost efficient models has become even more imperative as the European Union looks to build upon existing US legislation but with a global scope, looking beyond today's focus on central Africa. The ongoing trend of tantalum end-users and electronics consumers (imposing higher transparency requirements throughout the supply chain and all the way to mine sites) also calls for reconsidering the atomised local procurement context and associated supply chain inefficiencies.

(continued)

The paper looks at existing models and pilots of alternate approaches in the spirit and to the letter of the OECD Due Diligence guidance - the international compliance standard, and its doctrine of continuous improvement of upstream supply chain circumstances. It is based on the AVX and BSP joint attempt at reconciling compliance expectations with business objectives of reliable and sustainable tantalum ore sources.

### **Panda Hill Tanzania Ltd: the progress to date and roadmap for the development of the world's next new primary niobium mine**

by Dennis Cooke, Panda Hill Tanzania Ltd

The Panda Hill niobium deposit is situated close to Mbeya in the south western part of Tanzania. The deposit has been explored since the 1950s with a number of parties contributing towards the identification of a large primary niobium deposit. The project was acquired by Cradle Resources in April 2013 and a scoping study was performed for the construction of a ferro-niobium producing mine and processing plant. A prefeasibility study followed with Denham Capital investing in the project on the back of the results. The feasibility study, which followed, included additional exploration and intensive pilot test work on the ore body samples. The results of the feasibility study indicated that the project is technically feasible and could realise appropriate financial returns for the investors. The project team is currently performing front end engineering on the project whilst the financing team is currently engaged in the raising of the capital for the project execution. The presentation will discuss the development of the project in general, the details and outcome of the feasibility study and the roadmap to production for the first new primary niobium producer in many years.

### **Effects of ambient atmosphere on performance and reliability of solid tantalum capacitors**

by Yuri Freeman and Phil Lessner, KEMET Electronics Corporation

The reputation of tantalum (Ta) capacitors depends strongly on their performance and reliability in harsh applications such as automotive, military and space. Moisture is the most common cause for the failures in all the electronic components due to the moisture induced corrosion, ion migration, tin whiskers, popcorn effects, etc. All these failure mechanisms can take place in solid Ta capacitors, especially, in automotive applications, where high humidity combines with high temperature. At the same time absence of moisture due to the long-term exposure to dry air or vacuum in space can also cause parametric and catastrophic failures in MnO<sub>2</sub> and polymer Ta capacitors. The paper describes the root causes of these failures and technological means to avoid them. Presented in the paper results show that typical failures in solid Ta capacitors even in the harshest applications come not from the "bad nature" of tantalum, but from the specific technology or lack of technology used in manufacturing of these capacitors.

### **An update on the iTSCi programme after five years of operations**

by Karen Hayes (Pact Inc.), Kay Nimmo (ITRI Ltd), and Roland Chavasse (T.I.C.) (presented by Karen Hayes and Roland Chavasse)

Since 2010 tantalite production from central Africa has grown to become a key supplier in the global tantalum supply chain and the iTSCi Programme has played a key role in facilitating this development. Since its formalisation as a membership organisation in 2011 the iTSCi Programme has rapidly grown in both scale and scope, becoming an industry standard for due diligence and traceability for the upstream '3T' minerals from four countries of the central African region. The T.I.C. continues to play an important role in the Programme through its role on the iTSCi Governance Committee, while the administrative iTSCi Secretariat is run by ITRI, the tin industry organisation.

This paper will provide an overview of how the situation in central Africa has changed since 2010 and the Programme's successful efforts to legitimise 3T mineral production and trade as a path to stability in the region. The Programme's success can be attributed to the effective combination of practical on-the-ground assistance for small scale operators and authorities in high risk areas, with understanding of market requirements and leadership in discussion of appropriate international policies. The paper will also discuss links between iTSCi and due diligence guidance from the OECD and CCCMC, the imminent EU regulation on certification of imports of minerals and metals, our cooperation and harmonisation with the Conflict-Free Smelter Programme (CFSP), and other key stakeholders.

*(continued)*



## **Selected tantalum and niobium myths**

by David Henderson, Rittenhouse International Resources LLC

There are many inaccuracies and myths about the tantalum and niobium industries. Some are promulgated by individual companies, who are seeking to position their business in the best possible light, while others come from various entities, such as government agencies or the trade press. The author will highlight some of them, as illustrative of and rationale for the long term education and promotion initiative which the T.I.C. has embarked on.

## **Development of polymer tantalum capacitors with high reliability and high rated voltage**

by Kazuhiro Koike, NEC TOKIN Corporation

With the advancements of technology in the fields of IT infrastructure and automotive electronics, the opportunities for high reliability and high rated voltage capacitors have been expanding. Tantalum capacitors have gained favor from these market opportunities due to their high capacitance per unit volume and stable electrical characteristics.

In recent years, ceramic capacitors and aluminum capacitors with high reliability and high rated voltage have been released, also in response to expanding market needs. However, these capacitors have certain negative aspects in their electrical characteristics which can limit their applicability. Ceramic capacitors have acoustic noise issues when under AC bias. In addition, their capacitance can be reduced depending on applied voltage and ambient temperature conditions. Aluminum capacitors have limitations in their ability to be miniaturized.

We will report on our activity and results towards the development of tantalum capacitors with high reliability and high rated voltage. We have been developing unique technologies and application techniques of tantalum powder for developing high voltage tantalum capacitors. Key to the development of these high voltage and high reliability tantalum capacitors are the tantalum capacitor powders used in the manufacture of the capacitors. In our report, we will show our development roadmap for tantalum capacitors with high reliability and high rated voltage, and make an explanation of the future prospects for these products. We will refer to some of our applied technologies and present our specific requirements to the tantalum capacitor powder manufacturers.

## **New and newly applied technologies for quantitatively separating tantalum and niobium from process leach solutions prepared from ores, ore tailings and scrap**

by Jack Lifton, Jack Lifton LLC

A remarkable renaissance in process chemistry development in the USA has now provided a variety of new and newly applied separation technologies for selectively recovering desired values from mixed process leach solutions. The driver for these developments is twofold: first of all, the best and most accessible deposits of common metals have been high graded for a long time, and their grade decline has required expensive, but mostly short-term fixes to traditional process regimes; and secondly, the technology metals mostly obtained as by- or co-products of common metals production are a once through proposition; if they are recovered at all it is only from the first time that the common metal ores are processed. After that recycling of the common metals does not again extract the technology metals.

Tantalum is a “companion metal”. It is produced mostly as a by/co-product of niobium mining. High (tantalum) value scrap is recycled whenever and wherever economically feasible. Niobium itself is also only recycled from selected high (niobium) value scraps.

Research and development of selectivity in extractants in the last 30 years have now made it possible to compare the costs and efficiency of traditional solvent extraction with the now highly developed molecular recognition technology and continuous ion exchange chromatography as methods for the primary, as well as the secondary recovery of tantalum (as well as niobium) from the process leach solutions obtained from ores, tailings, and scraps. The results are surely “game-changing”, but traditional processing inertia must be overcome.

*(continued)*

## **The Metalysis process: a new era for alloy design and discovery**

by Ian Mellor, Greg Doughty and Ian Margerison, Metalysis Ltd

A salient feature, and distinct advantage of the Metalysis process, lies within its capacity to generate a wide range of metals in the periodic table, where the production of tantalum eloquently demonstrates this. However, to date an equally significant but less exploited feature, relates to the ability to generate a vast number of alloys and intermetallics. Due to the fact that the electrolysis step is conducted solely in the solid state, it is possible to combine elements of differing melting points and densities, which would be extremely challenging or impossible to homogenise via more conventional means.

This presentation describes several case studies pertaining to the manufacture of tantalum based alloys and intermetallics, aimed towards various powder metallurgy techniques, with a particular emphasis on additive manufacturing. The opportunity to control particle size and its corresponding distribution, in parallel with tailoring the associated chemistry, allows the boundaries of targeted properties to be expanded, over and above current state of the art. Consequently, this has wide ranging implications for a multitude of applications and industrial sectors, signaling the dawn of a new era in alloy design and discovery, whilst diversifying the utilisation of tantalum and niobium, promoting their potential use in new areas.

## **New market segments and product technical achievements with polymer tantalum surface mount capacitors**

by Cristina Mota Caetano, Ana Tomás, Randy Hahn and Denis Lacombe, KEMET Electronics Corporation

KEMET has been manufacturing conductive polymer based surface mount tantalum capacitors since 1999. In the last 15 years we have focused on expanding our Ta polymer capacitor portfolio to meet the increasing adoption into circuit designs. Many capabilities have been successfully introduced into the market, such as low equivalent series resistance (ESR) for decoupling, high rated voltage up to 75V for DC-DC converter and power management, and high reliability for military and aerospace. In order to support adoption of conductive polymer based tantalum capacitors in Military, Aerospace and Space applications, KEMET is expanding the KO COTS T540/T541 Series capability to include 85°C/85% rated voltage up to 1000h qualification. And is completing the T583 Series qualification according to European Space Agency, ESCC Generic Specification 3012.

Since 2012 KEMET has been working in collaboration with European Space Agency to introduce a polymer surface mount tantalum capacitor qualified according to ESCC3012. In the end of 2015 KEMET accomplished the 1st step of the high reliability series introduction with official issuing by ESA of ESCC Detailed Specification N° 3012/005 and the addition to European Preference Part List 2 (EPPL2). The qualification process to achieve the Qualified Part List (QPL) is in progress. In this paper the technical challenges and solutions for polymer Ta capacitors under unbiased and biased high temperature and high humidity are discussed. To finalize a summary of main challenges and achievements with high reliability products with ESA, and the future roadmap are described.

## **Tantalum supply chains today: how responsible are they?**

by Sophia Pickles, Global Witness

If you have ever wondered how violent armed groups can afford to pay and equip their fighters, even in some of the world's poorest countries, at least part of the answer is often found in and around artisanal mining sites. Some armed groups seize and run mines of their own, but this kind of mining is treacherous. Many therefore prefer to extort or illegally tax independent miners who have little choice but to brave its many hazards in search of a livelihood. Others still choose to levy tolls on key transportation routes in areas where the government offers little protection, or run smuggling operations designed to frustrate regulators and tax-collectors.

The links between the minerals trade and conflict are not always simple and not always the same. There are undoubtedly cases in which violence is aimed directly at control of natural resources. More often, however, the root causes of a conflict go much deeper. In such cases, ready access to the cash supplied by the minerals trade can still intensify violence and prolong conflict, creating economic incentives that favour continued chaos over peace.

This illicit trade has flourished because there has often been undiscerning and ready market for these resources. Global supply chains--many of which lead to major markets like the EU, US or China --are often highly secretive and poorly regulated. It doesn't have to be this way. When companies work together to make their supply chains more transparent they can ask questions and identify warning signs that might warrant further investigation and action.

*(continued)*



Legislators and some companies are beginning to take notice. Guidance developed by the UN and the OECD can help companies to source minerals like tantalum responsibly. In some jurisdictions, legislation requiring companies to exercise due diligence on tantalum supply chains exists – or is on its way. This paper examines where tantalum supply chains are today in terms of responsible sourcing.

### **Tantalite supply from the lithium industry**

by Michael Tamlin, Neometals Ltd

Tantalite and other tantalum minerals co-occur with lithium minerals in many pegmatites. Lithium mineral production is rising due to the double digit growth in lithium demand from electric vehicles. By-product tantalite production is likely to increase as a result. Some instances of primary tantalite production like Greenbushes and Tanco Mine are well known to T.I.C. members from past operations although they are now closed as significant producers. The lithium mineral spodumene occurred with tantalite at both mines. At Greenbushes, spodumene was produced as a technical grade concentrate from an adjacent section of the pegmatite while a large quantity of spodumene was rejected from the tantalite concentrator tailing because there was no economic use for large volumes at the time. At Tanco Mine, spodumene concentrate was mined and processed separately to the tantalite. Since then, the production of spodumene has doubled in response to the demand while tantalite production has declined at the major mines so tantalite by-product is becoming more common. Will the aggregate be a significant share of global production? This paper examines the potential sources of tantalite as by-product from new and future lithium mineral operations globally.

### **Tantalum applications in numismatics and jewelry**

by Alexey Tsorayev, NAC Kazatomprom / Ulba Metallurgical Plant JSC

Recently tantalum has been used in jewelry and numismatics along with its traditional fields of application. This is facilitated by its unique properties such as corrosion resistance, high plasticity, ability to be polished with a mixture of very strong acids and property to be covered with very thin and strong oxide film of beautiful iridescent colors such as intensely green, purple or iridescent blue when anodized at very high voltage. In many cases platinum is successfully replaced with tantalum in jewelry business and numismatics. Furthermore tantalum is used for production of coins, medals, watchcases, bracelets and various adornments that arise sensation of heaviness as tantalum density is close to the density of gold. Tantalum is quite a rare and expensive material that makes it valuable for jewelry and numismatics where the majority of products are manufactured by means of forging due to the fact that tantalum cannot be soldered or welded. Kazakhstan Mint is located on the same production site as Ulba Metallurgical Plant JSC, the Kazakhstan tantalum producer, and mastered the production of bicolor commemorative coins in 2006. Sophisticated technology of minting and techniques of decoration are applied to enable the coins to be treated as means of payment at their nominal value as well as collectibles, investment and hoarding at a value different from nominal. Kazakhstan Mint today is a modern dynamic business with highly qualified personnel and efficient equipment.

### **Study of large scale large grain superconductor niobium disks**

by Zhao Hong-yun, Chen Ming-lun, You Yu-song and Huang Jun-feng, CNMC Ningxia Orient Group (presented by Jiang Bin)

The paper describes the physical properties of large grain niobium and its application in superconductor cavities, and the research into the processes to produce the 483 mm diameter disk large grain niobium. The difficulty in rolling niobium ingot is intergranular fracture, which was first researched and found that 290 mm diameter niobium ingot with cast large grains could be processed to 483 mm diameter disks with the same large grain, by rolling and vacuum annealing. The distribution of the grains is similar to the original ingot. The 483 mm diameter disk large grain niobium exhibited good plasticity and finished deep drawing to half cell without defect. Compared with normal metal deformation processes, the paper shows how the original metal grain could be maintained throughout rolling and annealing, to produce the large size large grain superconductor niobium disk to meet the demands for SRF cavity fabrication.

# Miniaturization of chip tantalum capacitors

*Paper written by Daisuke Takada of NEC TOKIN Corporation, and presented by Daisuke Takada on October 27th 2015, as part of the Fifty-sixth General Assembly held in Penang, Malaysia.*

**D. Takada**

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## Abstract

The main feature of tantalum capacitors is their high capacitance compared to unit volume. In recent years, ceramic capacitors, MLCC, have expanded their market because of small volume and cost performance. But MLCC have some performance limits. MLCC have problems with acoustic noise under AC signal, and capacitance changes when applied voltage and ambient temperature are changed, resulting in characteristic stability problems.

Tantalum capacitors are more stable and show less variance in capacitance. There is a steady demand for these characteristics from particular end-use sectors, such as wearable electric equipment or mobile medical equipment. Furthermore MLCC have a crack mode failure problem from PCB board flex. Thin MLCC are hard to manufacture, but we can manufacture thin tantalum capacitors.

This report explains the miniaturization of tantalum capacitors, and small, thin case size products for expanding applications. NEC TOKIN has developed high precision assembly technology and new terminal structures such as “substrate structure” for the small case size. NEC TOKIN also developed application engineering of High CV tantalum powder for high capacitance in small size cases. Development of High CV tantalum powder is a very important factor for thinner and smaller tantalum capacitors. This report examines the miniaturization and thinning progress of tantalum capacitors, from the past to the future. It will also explain some of the technologies of capacitor miniaturization, and describe desired properties of High CV tantalum powder for miniaturization technology.



## 1. NEC TOKIN NeoCapacitor

NEC TOKIN has two research and development sites in Japan, at Sendai and Toyama. The facility for producing capacitors is in Thailand.

NEC TOKIN started manufacturing tantalum capacitors in 1955 [Figure 1-2]. We started to produce dip type tantalum capacitors from 1970 and chip type tantalum capacitors from 1981. In 1994, the company released conductive polymer capacitors, called “NeoCapacitors”. NEC TOKIN has expanded technology of conductive polymer to Proadlizer and substrate package (GPS) products.



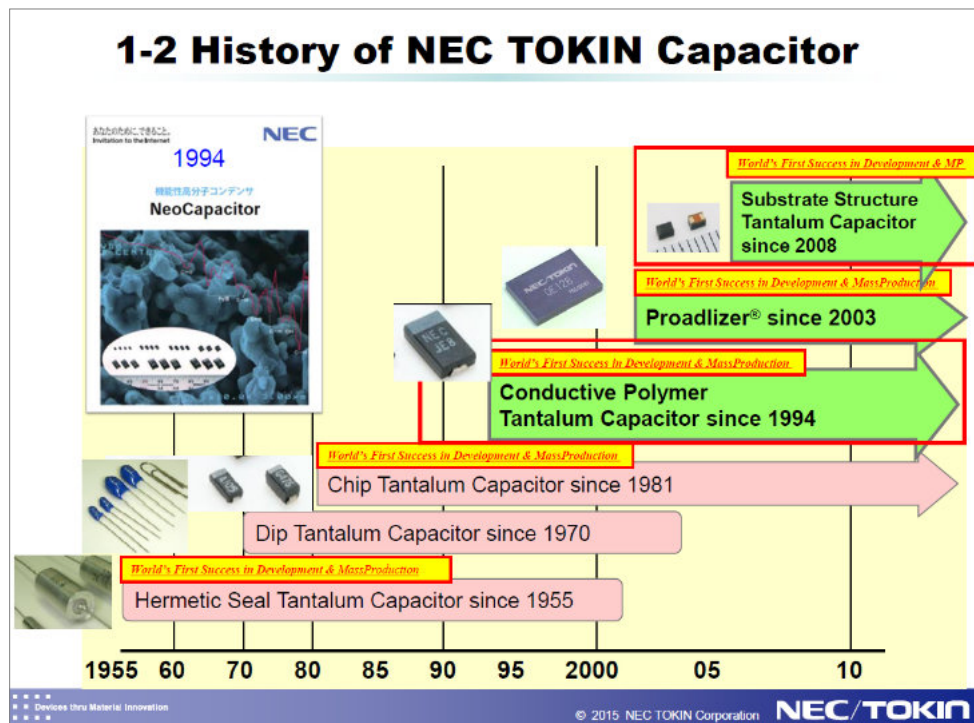


Figure 1-2

The conductive polymer is formed from tantalum pentoxide. The conductivity of the conductive polymer is about 100 times larger than manganese dioxide. So the ESR property of the tantalum capacitor decreased a lot [Figure 1-3]. NeoCapacitors are used in laptop computers, tablets and similar devices.

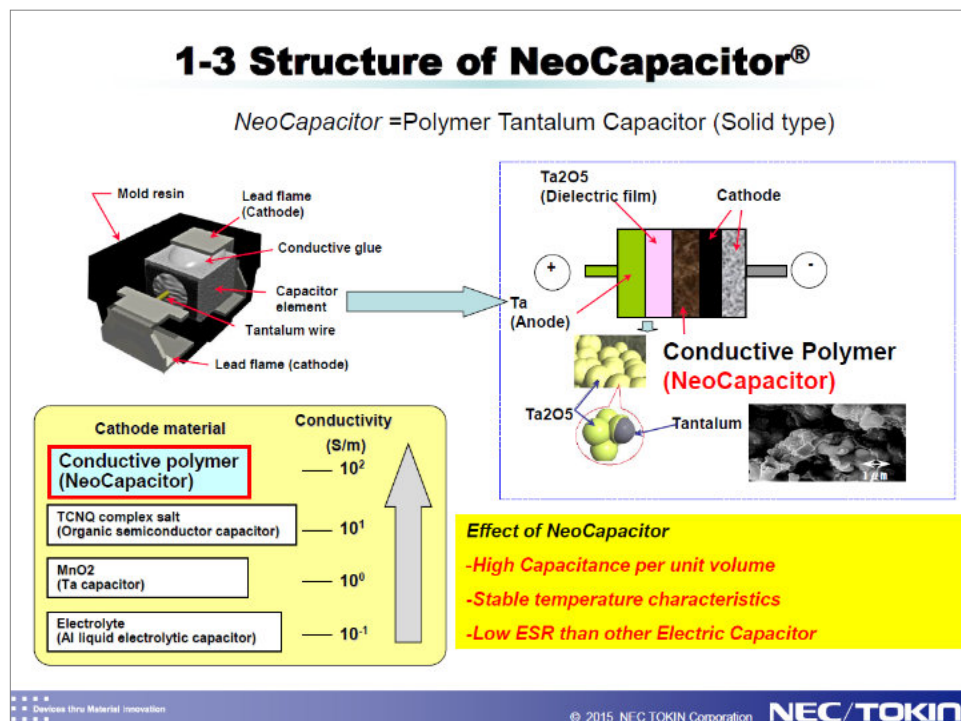


Figure 1-3

## 2. Market Trends

Figure 2-1 shows the latest consumer trends in the market. The trends for laptop computers, tablets and smartphones are towards smaller, thinner devices.

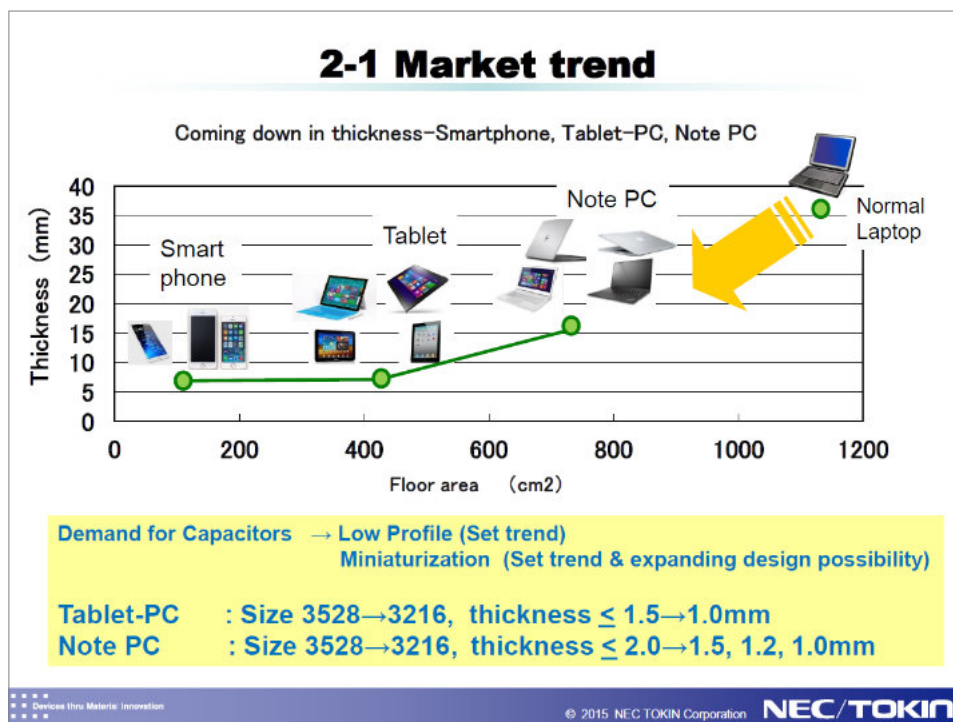


Figure 2-1

There are forecasts of demand for low profile devices such as 1.0mm height in near 1-2 years [Figure 2-2], and such as 0.6mm height and smaller size such as the 1005 model after 2-3 years.

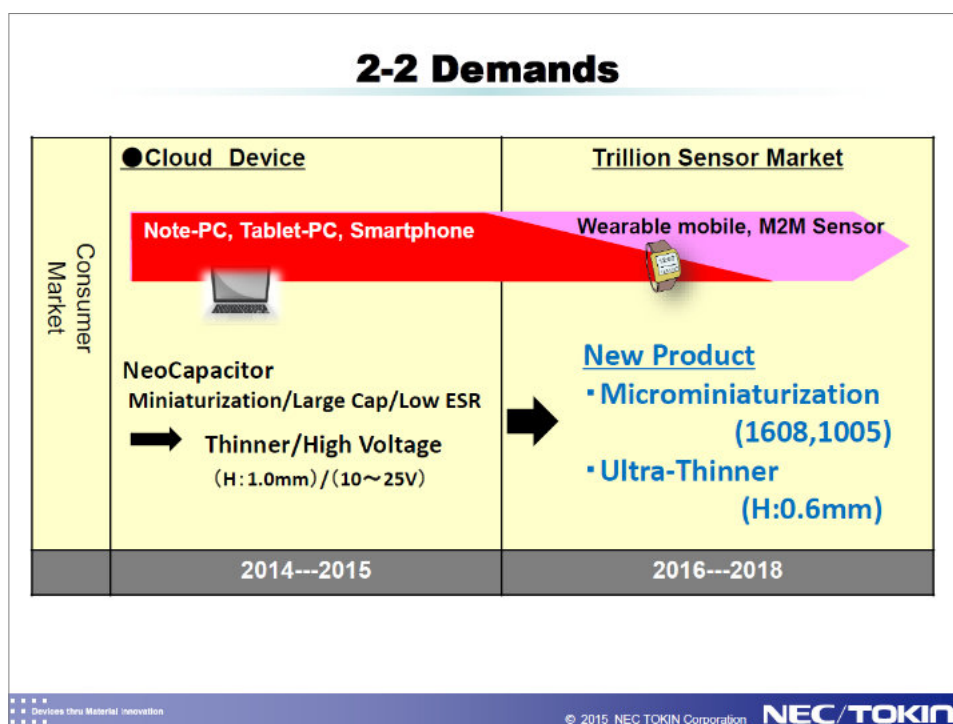


Figure 2-2

### 3. NEC TOKIN Strategy

Our direction is to make smaller & lower capacitors with GP/S structure. We have developed earlier than tantalum capacitor competitors such as MLCC [Figure 3-1]. NEC TOKIN has 4 kinds of series; Standard, Low ESR, Low profile (Facedown and Substrate). We can propose capacitors that are adapted to customers' requirements [Figure 3-2].



Figure 3-1

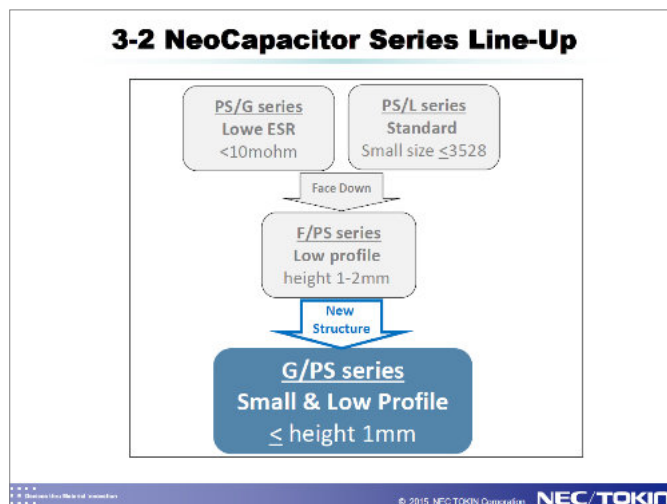


Figure 3-2

We compare NeoCapacitor and other capacitors with 6.3V/220uF. The can type of aluminium capacitor is taller and wider, compared with NeoCapacitor. Chip type of aluminium capacitor is as tall but wider than NeoCapacitor. MLCC is a similar footprint and height but smaller capacitance, compared with NeoCapacitor [Figure 3-3].

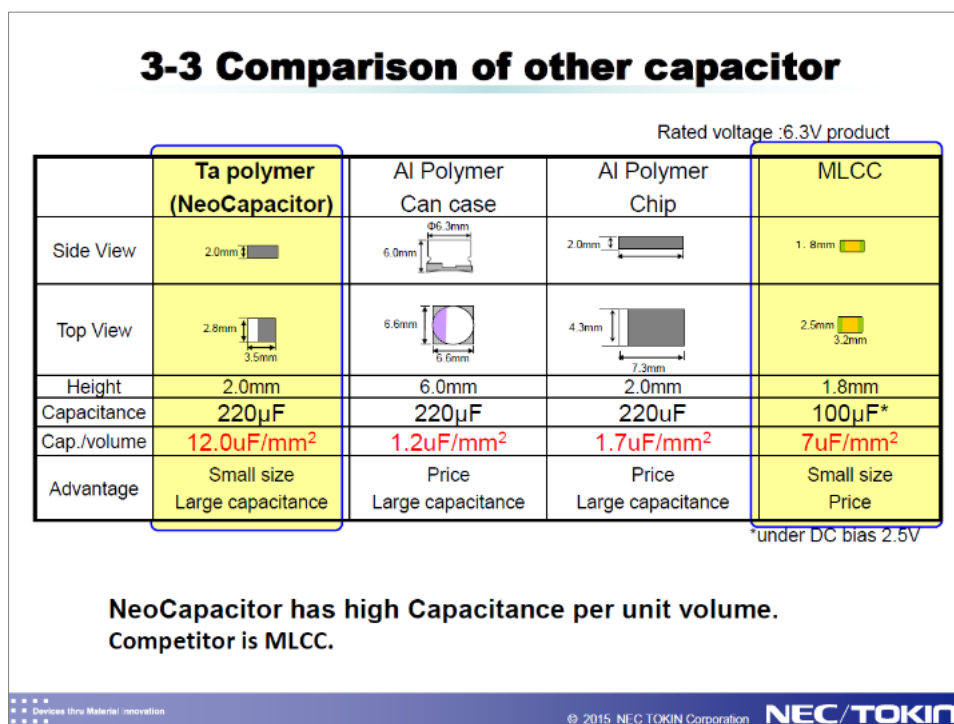


Figure 3-3

MLCC competitor tries to catch up with Tantalum about capacitance. MLCC have acoustic noise and crack problems. They try to improve these problems with metal terminal, but MLCC will be tall more as picture.



On the other hand, we do not have the same problems as MLCC, so NEC TOKIN's tantalum capacitors can compete against MLCC in the consumer market of miniaturization.

Polymer tantalum capacitors have advantages, compared with MLCC and Aluminum capacitors in the following ways; [Figure3-4]

1. NeoCapacitor is small and has high capacitance. NeoCapacitor has the best volume efficiency versus MLCC and Aluminum capacitors. Customers need many MLCC and big Aluminum can case, however we will be able to replace those by one small Tantalum capacitor.
2. MLCC has piezoelectric effect. So MLCC have acoustic noise once electric signal is added. This acoustic noise will be a problem once customer feels so noisy. NeoCapacitor do not have piezoelectric effect and do not have acoustic noise problem.
3. MLCC lose much capacitance once voltage is charged. This capacitance change will be a problem if customers need stable capacitance in a voltage variable circuit. NeoCapacitor have constant capacitance once voltage is charged.
4. MLCC lose capacitance at high and low temperature because of ceramic property. NeoCapacitor have small capacitance change at wide temperature range.

The net position is that smaller & lower NeoCapacitors can compete against MLCC.

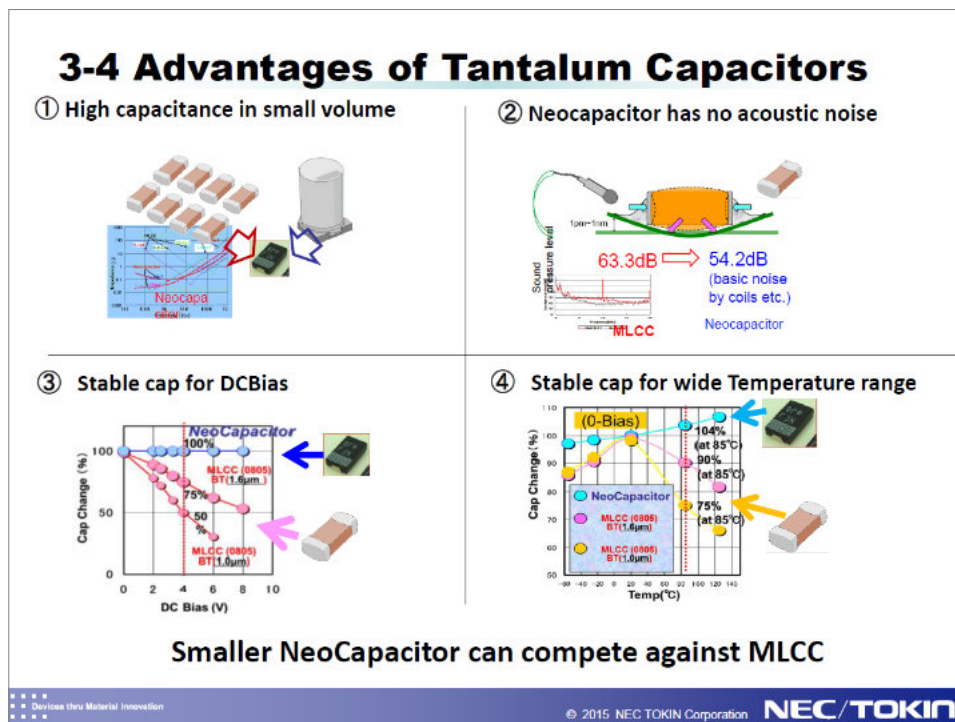


Figure 3-4

#### 4. NEC TOKIN technologies

We have been developing the structure of capacitors to make their size smaller and their volumetric efficiency higher. For example the GP/S structure has 55% volumetric efficiency. [Figure 4-1]

Characteristic technologies of GP/S series are 1) elements, 2) anode connection, 3) mould and 4) substrate. These technologies work on changeable Size & Height and the productivity [Figure 4-2].

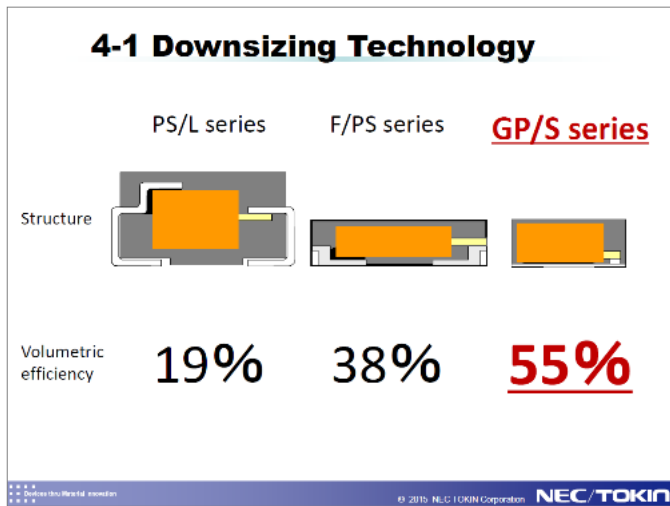


Figure 4-1

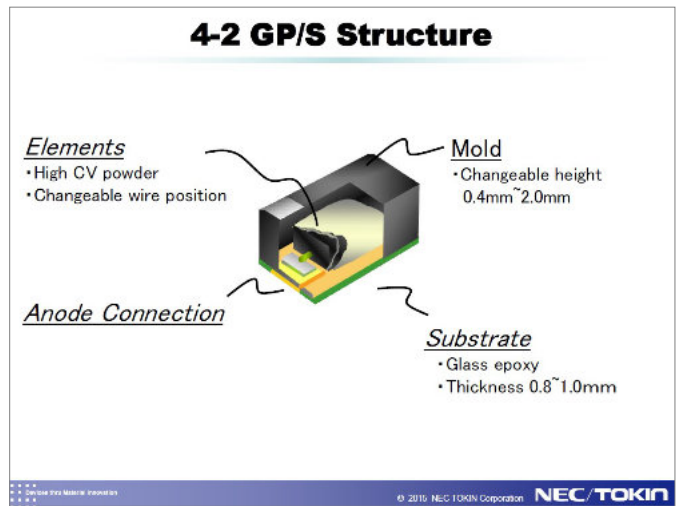


Figure 4-2

We can use a common spacer with changeable wire position technology. We fix the wire position. This structure has the changeable height by 0.1mm. Changeable wire position and flexible molding method works on this. Anode connection design and substrate contribute towards better productivity [Figure 4-3, 4-4]. Tantalum capacitors with footprints of 1.0mmx0.5mm ~ 3.5mmx2.8mm and heights of 0.6mm~2.0mm are available.

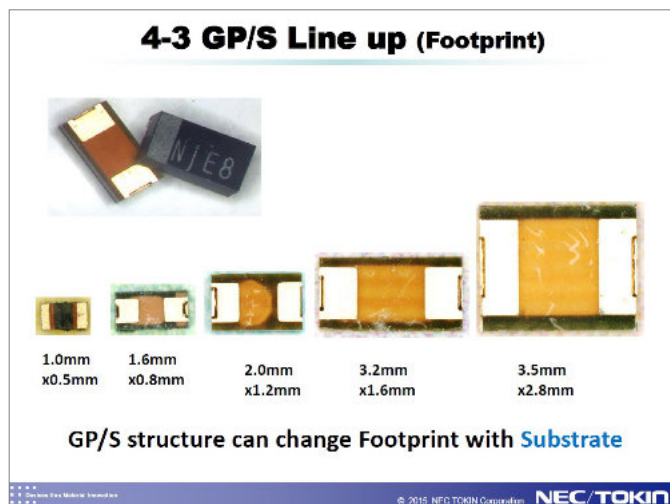


Figure 4-3

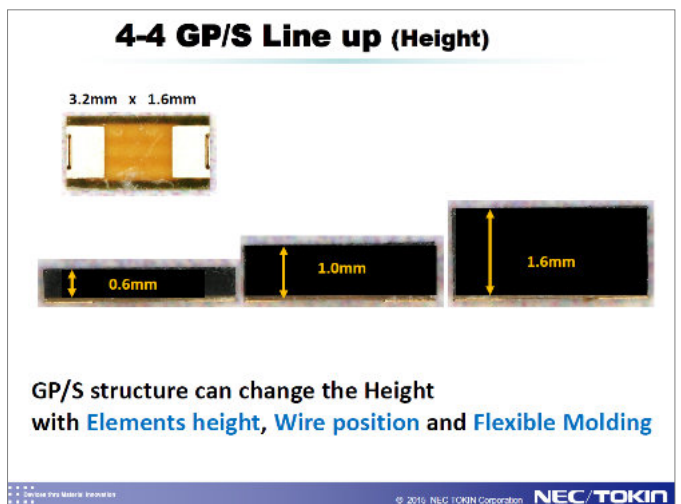


Figure 4-4

Thinner anodes can have difficulties. An example of this is warping after sintering. The deviation of press density and sintering temperature causes the warping. We can control anode thickness [Figure 4-5].



Figure 4-5

Next for 0.4mm height products, we try uniform polymerization and plating method to control these thicknesses. By the conventional design Chemical polymerization and Silver paste it's quite difficult to control the thickness. [Figure 4-6]

High CV powder is necessary for capacitance. In formation we have controlled  $Ta_2O_5$  and in polymer process we have optimized polymerization factors.

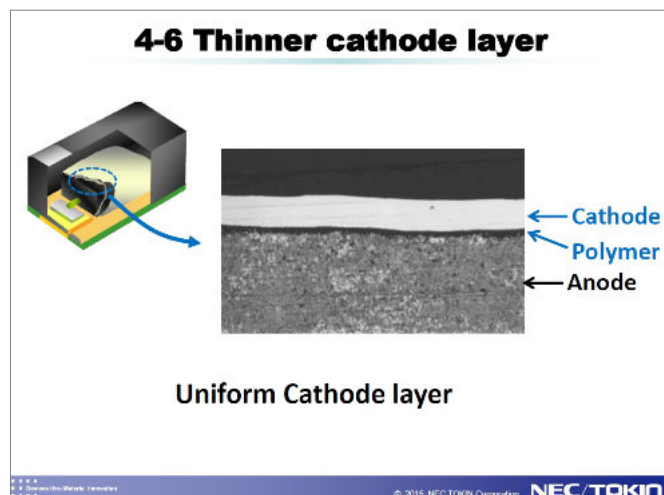
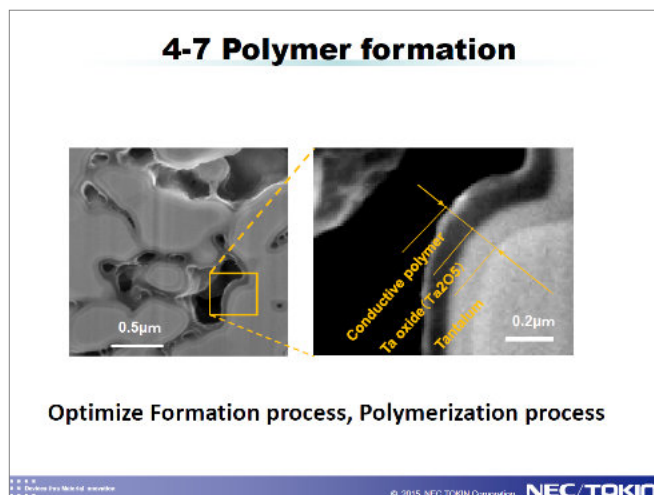


Figure 4-6



Figures 4-7

## 5. Summary

This is an example of application to Tablet PC and Smartphone. NeoCapacitor are applied around power supply. Small and low profile and high capacitance property is needed because set trend will be smaller and thinner [Figure 5-1]. This is an example that we can replace MLCC 5pcs by NeoCapacitor 1pc only. This proposal can be contributed to miniaturization of Smartphone [Figure 5-2].

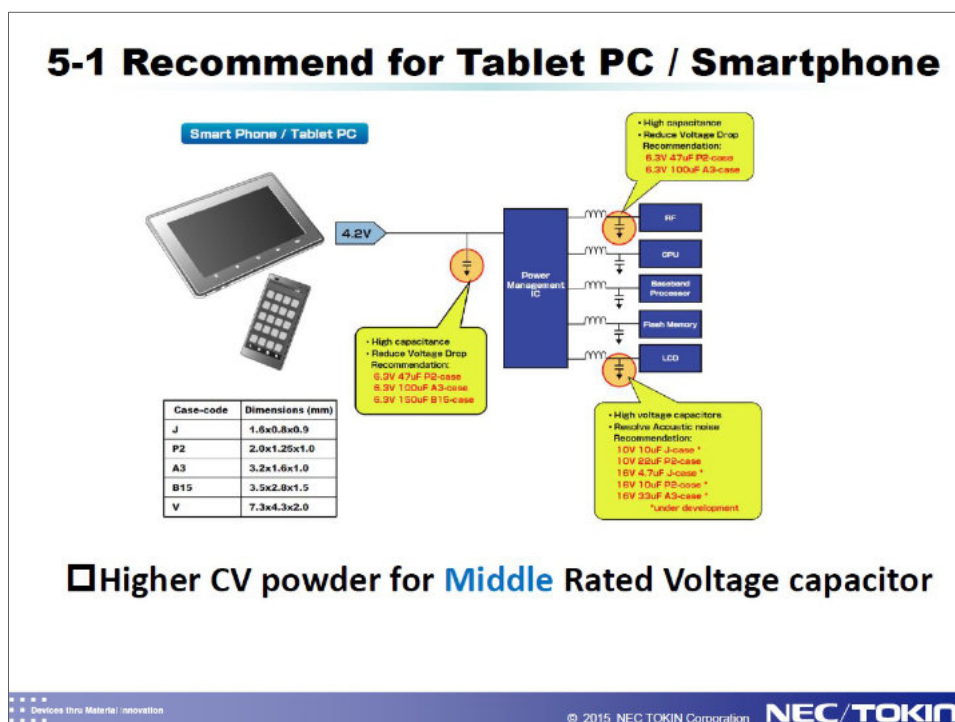


Figure 5-1

We focus on the miniaturization; however there is a lot of market potential, for example in the fields of high reliability or high frequency. To succeed we need to combine miniaturization and high reliability [Figure 5-3].



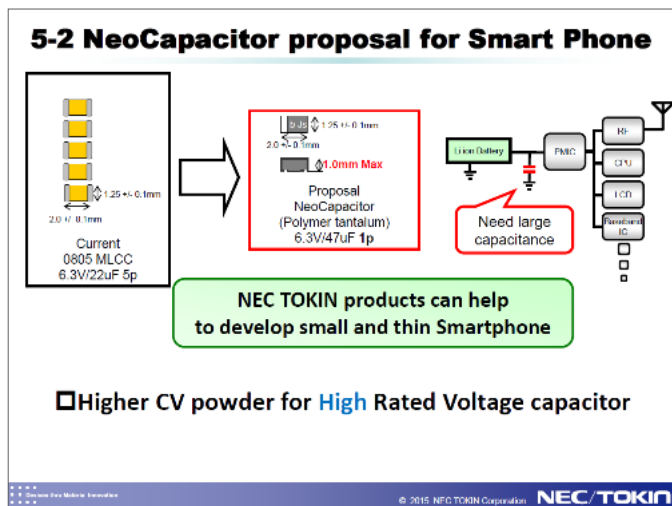


Figure 5-2

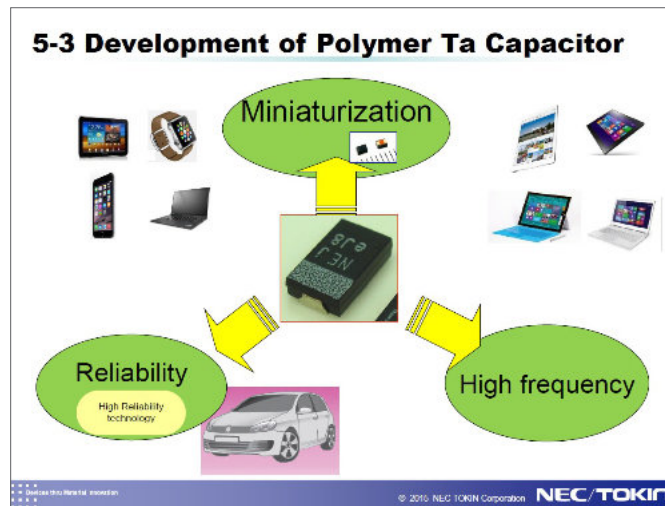


Figure 5-3

## Member company news

### Changes in member contact details

**A&R Merchants Inc** has relocated to new premises at 2101 NW 93<sup>rd</sup> Avenue, Doral FL 33172, United States.

**A.S. Metallurgy (Liverpool) Ltd** has changed its name to AS International Corporation Ltd.

**Exotech, Inc** has announced the promotion of David Gussack to President of the company.

**Metherma KG:** Mr Tobias Strathmann has become the delegate to the T.I.C. for Metherma KG, in the place of Mr Rolf Schleenbecker. Metherma can be contacted on [molybdenum@metherma.de](mailto:molybdenum@metherma.de).

**MTU Aero Engines GmbH:** Mr Maximilian Pfaus has become the delegate to the T.I.C. for MTU Aero Engines GmbH, in the place of Mr Robert Winter. Mr Pfaus can be reached on [maximilian.pfaus@mtu.de](mailto:maximilian.pfaus@mtu.de).

**Thailand Smelting & Refining Co. Ltd:** Mr Nick Thorne has been confirmed as the permanent Managing Director at Thailand Smelting and Refining. Mr Thorne can be reached via [sales@thaisarco.com](mailto:sales@thaisarco.com).

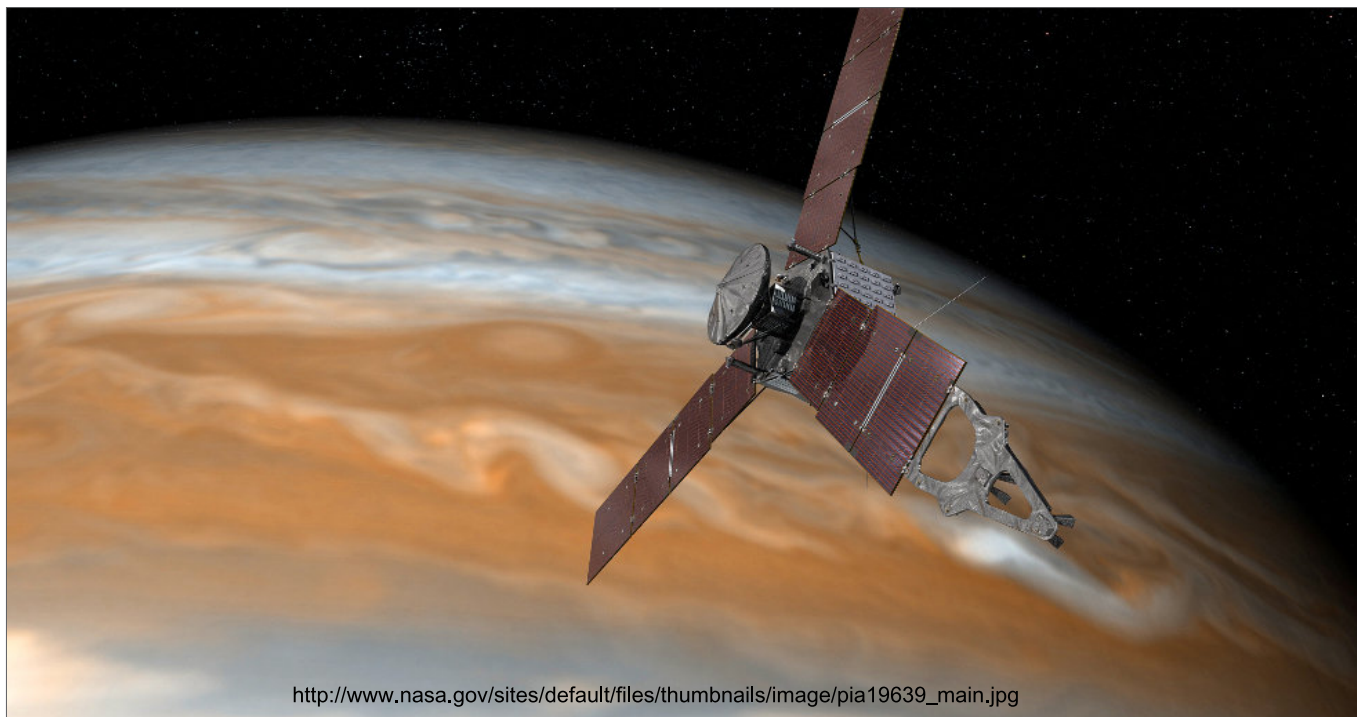
## Members of the Executive Committee of the T.I.C.

The Executive Committee is drawn from the membership and committee members may be, but need not also be, the delegates of member companies. The current Executive Committee that was approved by the T.I.C. members at the Fifty-sixth General Assembly consists of (in alphabetical order of member's surname):

Conor Broughton	<a href="mailto:conor@amgroup.uk.com">conor@amgroup.uk.com</a>
John Crawley	<a href="mailto:jcrawley@rmmc.com.hk">jcrawley@rmmc.com.hk</a>
David Gussack	<a href="mailto:david@exotech.com">david@exotech.com</a>
Dale Gwinnutt	<a href="mailto:dalegwinnutt@elitematerial.com">dalegwinnutt@elitematerial.com</a>
David Henderson (President)	<a href="mailto:dhenderson@rittenhouseir.com">dhenderson@rittenhouseir.com</a>
Marc Hüppeler	<a href="mailto:marc.hueppeler@hcstarck.com">marc.hueppeler@hcstarck.com</a>
Jiang Bin	<a href="mailto:jiangb_nnec@otic.com.cn">jiangb_nnec@otic.com.cn</a>
William Millman	<a href="mailto:bill.millman@avx.com">bill.millman@avx.com</a>
David O'Brock	<a href="mailto:david.obrock@molycorp.com">david.obrock@molycorp.com</a>
Candida Owens	<a href="mailto:candida.owens@btinternet.com">candida.owens@btinternet.com</a>
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We are always looking for enthusiastic T.I.C. members to join our range of sub-teams. If you are interested in doing so and have an hour per month spare, please don't hesitate to contact the T.I.C.

## And finally... NASA sends tantalum samples to the planet Jupiter



[http://www.nasa.gov/sites/default/files/thumbnails/image/pia19639\\_main.jpg](http://www.nasa.gov/sites/default/files/thumbnails/image/pia19639_main.jpg)

On 5th July NASA scientists confirmed that their Juno spacecraft was successfully orbiting the planet Jupiter. This incredible machine is not only packed with tantalum capacitors in its electronic components, but also uses tough tantalum shielding to protect the external sensors of its scientific instruments from dust and meteorites as it travelled to the giant gas planet at up to 165,000 miles an hour. Tantalum and niobium will almost certainly also be present in the superalloys used in the rocket nozzle and shielding on Juno.

Launched from Earth in 2011 and costing US\$1.1 billion, the Juno spacecraft will study the giant planet from an elliptical, polar orbit, repeatedly diving between the planet and its intense belts of charged particle radiation. Juno's primary goal is to improve our understanding of Jupiter's formation and evolution. It will spend a year investigating the planet's interior structure and magnetosphere before becoming overpowered by Jupiter's gravity and crashing through the clouds towards the planet's core. **TIC**

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