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**The Ekeberg Prize
2026: Winner**

(page 16)



**67th General Assembly:
Technical Programme**

(pages 17 - 19)



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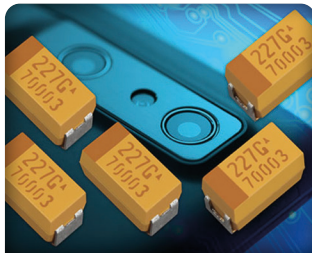
(Conference and AGM) will take place in

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September 19th-22nd 2027

Non-members are welcome to attend this event. The T.I.C. General Assembly attracts global industry leaders. Full details will be made available at www.tanb.org

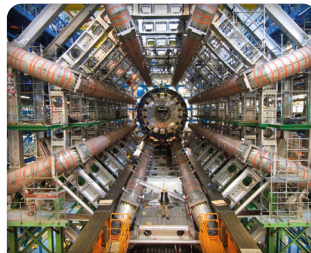
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Message from the T.I.C. President



Dear Members & Guests,

It is my great pleasure to welcome delegates from around the world to the 67th General Assembly of the Tantalum-Niobium International Study Center (T.I.C.) in Yinchuan, Ningxia.

Yinchuan is a fitting location for our General Assembly. With a history spanning more than 2,000 years, the city has long been an important centre of trade, culture and industry. Ningxia also has a strong tradition in mining, minerals and metallurgy, making the region particularly relevant to our industry.

Tantalum and niobium are essential materials for modern technologies, with applications ranging from electronics and aerospace to energy, medical technology and other advanced industries. As demand for these materials develops, secure supply, responsible production, recycling and continued technical innovation remain important priorities for our industry.

GA67 provides an excellent opportunity for our international community to meet, exchange knowledge and strengthen relationships across the global tantalum and niobium value chain. I am confident that the presentations, discussions and informal exchanges during the General Assembly will provide valuable insights and help shape the future of our industry.

I would like to thank our host, Ningxia Orient Tantalum Industry Co., Ltd., together with our sponsors, speakers and delegates, for their support.

I hope you enjoy your time in Yinchuan and have the opportunity to experience the history, culture and hospitality of Ningxia.

Welcome to Yinchuan, and welcome to GA67.

Silvana Fehling

**President
Tantalum-Niobium International Study Center (T.I.C.)**



Contents

Featured articles:



**The Anders Gustaf
Ekeberg Tantalum
Prize: a retrospective**

Pages 9-12



**The Ekeberg Prize
2026: shortlisted
abstracts**

Pages 12-15

The Bulletin No.196
August 2026
ISSN 1019-2026



**The Anders Gustaf
Ekeberg Tantalum
Prize Winner**

Page 16



**67th General Assembly:
Technical Programme
abstracts**

Pages 20-24

Regular articles:

4-6	President's Welcome	25	New Members voted in at GA66
8	Message from the Executive Marketing Manager & Technical Officer	26	Diary of industry events

T. I. C. 主席致辞



親愛的會員與嘉賓們：

我谨代表Tantalum-Niobium International Study Center (T. I. C.)，热烈欢迎来到来自世界各地的代表参加在中国宁夏银川举行的第67届年度大会（GA67）。银川是一座拥有两千多年历史的城市，自古以来就是贸易、文化和工业发展的重要地区。宁夏在矿业、矿产资源和冶金领域也拥有悠久的历史，因此这里是举办T. I. C. 年度大会的理想之地。

钽和铌是现代科技发展的重要材料，广泛应用于电子、航空航天、能源、医疗技术以及其他先进产业。随着全球需求不断增长，保障供应安全、推动负责任生产、加强回收利用和持续技术创新，对我们的行业至关重要。

GA67为全球钽铌行业提供了一个重要的平台，让产业链各环节的代表能够相聚交流、分享经验，并进一步加强国际合作。我相信，本次大会将为行业未来的发展带来新的思路和机遇。

我谨向本次大会的东道主——宁夏东方钽业股份有限公司，以及所有赞助商、演讲嘉宾和参会代表表示衷心感谢。

希望各位在参加GA67期间，也能有机会感受银川悠久的历史、独特的文化以及宁夏人民的热情好客。

欢迎来到银川，欢迎参加GA67！

Silvana Fehling

主席

Tantalum-Niobium International Study Center (T.I.C.)

Mensagem do Presidente do T.I.C.



Caros membros e convidados,

É com grande prazer que dou as boas-vindas aos delegados de todo o mundo à 67ª Assembleia Geral do Tantalum-Niobium International Study Center (T.I.C.), em Yinchuan, Ningxia.

Yinchuan é um local especialmente adequado para a nossa Assembleia Geral. Com uma história de mais de 2.000 anos, a cidade tem sido, durante séculos, um importante centro de comércio, cultura e indústria. Ningxia também possui uma forte tradição nos setores de mineração, minerais e metalurgia, tornando a região particularmente relevante para a nossa indústria.

O tântalo e o nióbio são materiais essenciais para as tecnologias modernas, com aplicações que vão desde a eletrônica e a indústria aeroespacial até energia, tecnologia médica e outras indústrias avançadas. À medida que a procura por estes materiais continua a evoluir, a segurança do abastecimento, a produção responsável, a reciclagem e a inovação tecnológica permanecem prioridades importantes para o nosso setor.

A GA67 oferece uma excelente oportunidade para a nossa comunidade internacional se reunir, trocar conhecimentos e fortalecer relações em toda a cadeia global de valor do tântalo e do nióbio. Estou confiante de que as apresentações, discussões e encontros durante a Assembleia Geral proporcionarão informações valiosas e contribuirão para o futuro da nossa indústria.

Gostaria de agradecer ao nosso anfitrião, a Ningxia Orient Tantalum Industry Co., Ltd., bem como aos nossos patrocinadores, palestrantes e delegados, pelo seu apoio.

Espero que desfrutem da sua estadia em Yinchuan e tenham a oportunidade de conhecer a história, a cultura e a hospitalidade de Ningxia.

Sejam todos muito bem-vindos a Yinchuan e à GA67.

Silvana Fehling

Presidente

Tantalum-Niobium International Study Center (T.I.C.)

T.I.C.会長からのメッセージ



会員の皆様、ご来賓の皆様

第67回タンタル・ニオブ国際研究センター(T.I.C.)総会に、世界各国からお越しいただいた皆様を、ここ寧夏・銀川に心より歓迎いたします。

銀川は、今回の総会開催地として大変ふさわしい場所です。2,000年以上の歴史を持つ銀川は、古くから交易、文化、産業の重要な拠点として発展してきました。また、寧夏は鉱業、鉱物資源、冶金産業において長い伝統を有しており、私たちの業界とも深い関わりがあります。

タンタルとニオブは、エレクトロニクス、航空宇宙、エネルギー、医療技術など、現代のさまざまな先端産業を支える重要な素材です。今後も需要の変化に対応しながら、安定した供給、責任ある生産、リサイクル、そして技術革新を推進していくことが重要です。

GA67は、世界のタンタル・ニオブ業界に携わる皆様一堂に会し、知識や情報を共有し、国際的なつながりをさらに深める貴重な機会です。今回の発表や議論、交流が、業界の未来に向けた新たな知見と協力につながることを願っています。

開催にあたり、多大なご支援をいただいたホスト企業のNingxia Orient Tantalum Industry Co., Ltd.をはじめ、スポンサー、講演者、そしてすべての参加者の皆様に心より感謝申し上げます。

銀川での滞在を楽しみながら、寧夏の豊かな歴史、文化、そして温かいおもてなしにも触れていただければ幸いです。

銀川へ、そしてGA67へ、心より歓迎いたします。

Silvana Fehling

会長

Tantalum-Niobium International Study Center (T.I.C.)

Message du Président du T.I.C.



Chers membres et invités,

C'est avec grand plaisir que je souhaite la bienvenue aux délégués venus du monde entier à la 67e Assemblée Générale du Tantalum-Niobium International Study Center (T.I.C.), à Yinchuan, dans la région du Ningxia.

Yinchuan constitue un cadre particulièrement approprié pour notre Assemblée Générale. Forte d'une histoire de plus de 2 000 ans, la ville a longtemps été un important centre de commerce, de culture et d'industrie. Le Ningxia possède également une longue tradition dans les domaines de l'exploitation minière, des minerais et de la métallurgie, ce qui rend cette région particulièrement pertinente pour notre industrie.

Le tantale et le niobium sont des matériaux essentiels aux technologies modernes, avec des applications allant de l'électronique et de l'aérospatiale à l'énergie, aux technologies médicales et à de nombreuses autres industries de pointe. À mesure que la demande évolue, la sécurité de l'approvisionnement, une production responsable, le recyclage et l'innovation technologique demeurent des priorités importantes pour notre secteur.

La GA67 offre une excellente occasion à notre communauté internationale de se réunir, de partager ses connaissances et de renforcer les relations tout au long de la chaîne de valeur mondiale du tantale et du niobium. Je suis convaincu que les présentations, les discussions et les échanges qui auront lieu durant cette Assemblée Générale apporteront des perspectives précieuses et contribueront à façonner l'avenir de notre industrie.

Je tiens à remercier notre hôte, Ningxia Orient Tantalum Industry Co., Ltd., ainsi que nos sponsors, intervenants et délégués pour leur soutien.

J'espère que vous apprécierez votre séjour à Yinchuan et que vous aurez l'occasion de découvrir l'histoire, la culture et l'hospitalité du Ningxia.

Bienvenue à Yinchuan et bienvenue à la GA67.

Silvana Fehling

Président

Tantalum-Niobium International Study Center (T.I.C.)

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Message from the Executive Marketing Manager & Technical Officer



It is a great pleasure to welcome you to the T.I.C.'s 67th General Assembly in Yinchuan, Ningxia.

This year, we are delighted to welcome a **record number of delegates** from across the global tantalum and niobium industry. This excellent attendance reflects the strength of our industry and the importance of coming together to exchange knowledge, share experience and strengthen relationships.

GA67 brings together representatives from across the global value chain, including producers, processors, traders, recyclers, technology companies, end users and industry experts. Our programme covers technical developments, market trends, supply chains, responsible sourcing, recycling and the growing range of applications for tantalum and niobium.

We are particularly pleased to be meeting in Ningxia, a region with a long history of mining, metallurgy and materials production. We are extremely grateful to our host, **Ningxia Orient Tantalum Industry Co., Ltd. (OTIC)**, for its support in bringing GA67 to Yinchuan.

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We sincerely thank all our sponsors for their generous support and encourage delegates to take the opportunity to meet them during the conference.

Please also make full use of the **GA67 conference web-based app**, which provides the latest programme, speaker information and important announcements.

On Wednesday, I hope you will enjoy the visit to **Ningxia Orient Tantalum Industry Co., Ltd. (OTIC)**. This will provide an excellent opportunity to see its operations first-hand and learn more about tantalum production in Ningxia. We are very grateful to OTIC for opening its facilities to our delegates.

Finally, I would like to sincerely apologise to those delegates who have been unable to attend the **Gala Dinner**. The venue has a maximum capacity of 200 guests and, with record attendance this year, this limit was reached. Unfortunately, some delegates who registered later could not be accommodated.

We greatly appreciate your understanding and apologise for any disappointment. The exceptionally high attendance is, however, a wonderful indication of the strength and engagement of our international community.

I hope you enjoy GA67, meet old friends, make new connections and experience the history, culture and hospitality of Ningxia.

Welcome to Yinchuan, and I look forward to seeing you at GA67.

Warmest Regards

Ian

Ian Margerison

*Executive Marketing Manager & Technical Officer
Tantalum-Niobium International Study Center (T.I.C.)*

The Bulletin is published by the Tantalum-Niobium International Study Center (T.I.C.); ISSN 1019-2026. Editor: Ian Margerison; Production Director: Heather Margerison. The T.I.C. can be contacted at info@tanb.org; www.tanb.org; +32 2 649 51 58, or at the registered address: Chaussée de Louvain 490, 1380 Lasne, Belgium.

The T.I.C. is an international, non-profit association founded in 1974 under Belgian law that represents around 90 members from over 30 countries involved with all aspects of the tantalum and niobium industry. The T.I.C. is managed by an Executive Committee elected from the membership and representing all segments of the industry. Corporate membership costs EUR 3100 per year and full details of benefits are available at www.TaNb.org

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The Anders Gustaf Ekeberg Tantalum Prize: a retrospective

Recognising excellence in tantalum research and innovation

The Anders Gustaf Ekeberg Tantalum Prize ('Ekeberg Prize') is awarded annually by the T.I.C. for excellence in tantalum research and innovation and the new shortlist for the 2026 award shows that the level of interest in element #73 remains as high as ever.

The Ekeberg Prize was established by the T.I.C. in 2017 to increase awareness of the many unique properties of tantalum products and the applications in which they excel. To date the Ekeberg Prize has been awarded for outstanding work on the subjects of tantalum capacitors (2018, Dr Yuri Freeman), additive manufacturing (2019, Nicolas Soro et al), recycling tantalum by solvent extraction (2020, Prof. Jason Love et al) and cutting of tantalum (2021, Dr Jason M. Davis et al).

Technology-driven innovations will ensure the long-term future of the tantalum market and with so many potential new or embryonic applications in development there is every reason for optimism.

* Although T.I.C. represents and supports both tantalum and niobium equally, the Ekeberg Prize focuses on tantalum, because CBMM's Charles Hatchett Award (www.charles-hatchett.com) already superbly recognises niobium published research.

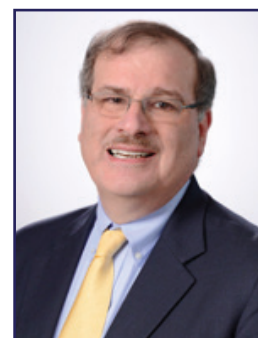
The judging panel for the Ekeberg Prize

The Ekeberg Prize is judged by an independent Panel of Experts who are selected from around the world to provide an impartial assessment on the technical merit of the shortlisted papers. Members of the current T.I.C. Executive Committee and staff cannot sit on the Panel. This year, we are honoured to have on the Panel the following experts:

Dr Philip Lessner

Consultant

Dr Philip Lessner is a seasoned consultant in the electronic components industry, bringing with him four decades of experience. He previously served as Chief Technology Officer at both the YAGEO Group and KEMET Electronics. Dr. Lessner holds a B.E. in Chemical Engineering from Cooper Union and a Ph.D. in Electrochemical Engineering from the University of California, Berkeley. Over the course of his career, he has been deeply involved in the development of tantalum capacitors, contributing nearly 30 years of technical expertise to this field.



Peter J. Bonitatibus Jr., PhD

Rensselaer Polytechnic Institute - Chemistry

Peter J. Bonitatibus Jr., PhD is an Associate Professor of Chemistry in the Department of Chemistry and Chemical Biology at Rensselaer Polytechnic Institute.





Magnus Ericsson

Luleå University of Technology, Sweden.

Magnus Ericsson is adjunct professor of Mineral Economics at Luleå University of Technology in the mining heart of Sweden. He is a founding partner in the independent advisors RMG Consulting. He has for decades been closely involved in developing a global mining database. He has established a reputation for developing among the best overviews of the world's mining industry. He has been involved in tantalum mining in Namibia and in an advisory capacity regarding social and community matters for a niobium project in Malawi. He is the deputy chair of the foundation establishing a museum at the site on Resarö outside Stockholm where tantalum was first isolated. He is a co-founder and Editor-in-Chief of the scientific journal Mineral Economics / Raw Materials Report, now in its 35th year.

Professor Toru H. Okabe

The Institute of Industrial Science, The University of Tokyo.

Dr Okabe's doctorate examined the processing of reactive metals, such as titanium and niobium, and his subsequent career has included postdoctoral research with Professor Donald Sadoway at Massachusetts Institute of Technology (MIT), USA. Dr Okabe specialises in materials science, environmental science, resource circulation engineering and rare metal process engineering. In addition to the research on the innovative production technology, he has worked on new recycling and environmental technology of rare metals, such as niobium, tantalum, scandium, tungsten, rhenium, and precious metals. Dr Okabe is Director General of the Institute of Industrial Science at The University of Tokyo. In 2021 he received an honorary degree from the Norwegian University of Science and Technology for his groundbreaking work on "urban mining".



Tomáš Zedníček Ph.D.

President of the European Passive Components Institute (EPCI).

Dr Zedníček's doctorate examined tantalum capacitors and was awarded in 2000 from the Technical University of Brno in the Czech Republic. Prior to establishing EPCI in 2014, he worked for over 21 years at a major tantalum capacitor manufacturer, including 15 years as the worldwide technical marketing manager. He has authored over 60 technical papers and a US/international patent on tantalum and niobium capacitors. He regularly presented at the CARTS passive component conference and other leading events. Since 2017 he has organized the PCNS bi-annual passive components symposium hosted by a European University. Dr Zedníček is a regular contributor to the Bulletin.



**The 2026 Anders Gustaf Ekeberg
Tantalum Prize will be awarded at the
67th General Assembly to be held
September 13th to 16th 2026,
Yinchuan, China.**

How the winner of the Ekeberg Prize 2026 will be announced

The winning publication will be announced in September 2026. The lead author will be invited to give a paper at the 67th General Assembly, to be held in Yinchuan, China, in September 2026. During the General Assembly there will be an award ceremony at which the lead author will be recognized by the tantalum industry and receive his/her Ekeberg Prize medal, made by the Kazakhstan Mint from pure tantalum metal (pictured on page 8). The T.I.C.'s General Assembly is open to both members and non-members; full details about the event, including speakers and how to book tickets are available at www.tanb.org/view/67th-general-assembly.

Previous winners

Since the Ekeberg Prize was launched there have been six winning publications, understanding differences in metal–imido bonding towards improving Ta/Nb separations, examining cutting of tantalum, recycling tantalum by solvent extraction, additive manufacturing and tantalum capacitors.

The 2025 Ekeberg Prize was awarded to: Dr. Mbolantenaina Rakotomalala Robinson, Dr. Rana Choumane, Prof. Domitille Giaume, and Dr. Grégory Lefèvre, from the Chimie ParisTech, PSL Research University, CNRS, Institut de Recherche de Chimie Paris (IRCP), Paris, France. Their paper is titled 'Tantalum recovery from alkaline leachates based on magnesium hexatantalate intermediate precipitate'.

Full article at: <https://pubs.rsc.org/en/content/articlelanding/2025/ra/d5ra02721g> for more information.

The 2024 Ekeberg Prize was awarded to a US team led by Benjamin M. Yeh, MD, for a paper on "The clinical translation of a tantalum oxide nanoparticle-based contrast agent for improved diagnostic CT imaging capabilities and patient safety through extensive non-GLP and GLP preclinical development, safety tests, and efficacy tests" published in the American Journal of Roentgenology 2023, [published online]. DOI:10.2214/AJR.23.29970.

In 2023 the Ekeberg Prize was awarded to the paper on 'Tailoring Nb-based alloys for Additive Manufacturing: From powder production to parameter optimization', Dr Axel Hoppe gave his reason for the vote as AM is a key technology for reducing cost and opens new markets for Ta/Nb demonstrating practical outcomes and readiness for mass production.

The 2022 winning publication The 2022 Anders Gustaf Ekeberg Tantalum Prize ('Ekeberg Prize') was awarded to a US team led by Professor Eric J. Schelter, for its paper "Tantalum, easy as Pi: understanding differences in metal–imido bonding towards improving Ta/Nb separations" published in the Chemical Science, Royal Society of Chemistry. (Reprinted in the T.I.C. Bulletin number 189, published in October 2022 and available at www.TaNb.org).

In 2021 the Anders Gustaf Ekeberg Tantalum Prize ('Ekeberg Prize') was awarded to a US-Japanese team led by Dr Jason M. Davis of the Center for Materials Processing and Tribology at Purdue University, IN, USA, for its paper "Cutting of tantalum: Why it is so difficult and what can be done about it" published in the journal International Journal of Machine Tools and Manufacture and also available in Bulletin issue 187, October 2021.

In 2020 the Ekeberg Prize was awarded to a team from Edinburgh University, UK, lead by Prof. Jason Love, for "Tantalum recycling by solvent extraction: chloride is better than fluoride" published in Metals. The paper examined the difficulties of recycling tantalum and discussed their work showing how Ta(V) halides, such as TaCl₅ and TaF₅, can potentially be accessed from tantalum metal upon acid halide leaching, and can then be recovered by solvent extraction using a simple primary amide reagent. They concluded that extraction of the fluorides was poor (up to 45%), excellent extraction under chloride conditions is found (>99%) and presents an alternative route to Ta recycling.

In 2019 the winning publication was by a team from The University of Queensland, Australia, for "Evaluation of the mechanical compatibility of additively manufactured porous Ti–25Ta alloy for load-bearing implant applications". The authors were Nicolas Soro, Hooyar Attar, Martin Veidt and Matthew Dargusch from the University of Queensland, Australia, and Erin Brodie and Andrey Molotnikov from Monash University, Australia.

The paper examined how additive manufacturing using Ti–25Ta alloy has enabled the optimisation of the mechanical properties of metallic biomaterials. The mechanical properties were found to be suitable for bone replacement applications, showing significantly reduced elastic moduli and superior mechanical compatibility compared to the conventionally used biomedical Ti–6Al–4V alloy, making the Ti–25Ta alloy a promising candidate for a new generation of load-bearing implants.

In 2018, the inaugural Ekeberg Prize was won by Dr Yuri Freeman of KEMET Electronics, for his book “Tantalum and Niobium-Based Capacitors”.

Dr Freeman has devoted most of his career to the development of Ta-based capacitors and made significant contributions, technological breakthroughs and performance improvements in these devices.

Dr Freeman is the Director of Advanced Research in the Tantalum (Ta) business unit and a member of the Advanced Technology Group at KEMET Electronics. He has published more than 30 papers and received 26 patents in the field of physics and technology of Ta and Nb-based capacitors.

The judges’ decision to choose the book by Dr Yuri Freeman reflected the general lack of basic books about tantalum and tantalum capacitors in education, as well as it being “a very good scientific overview, providing basic insight into the manufacturing process of Ta-based electrolytic capacitors”.

The Ekeberg Prize 2026: shortlisted abstracts

Recognising excellence in tantalum research and innovation

The Anders Gustaf Ekeberg Tantalum Prize (‘Ekeberg Prize’) is awarded annually by the T.I.C. for excellence in tantalum research and innovation. The winner will be announced in September, and the lead author will receive the award during the T.I.C.’s 67th General Assembly, scheduled to be held in Yinchuan, China, on September 13th to 16th 2026. Full details of the Ekeberg Prize winning publication and how to attend the 67th General Assembly are published on www.tanb.org

The following publications are shortlisted for the Ekeberg Prize 2026:

Metallic θ -phase tantalum nitride has a thermal conductivity triple that of copper

Authors: ^a Suixuan Li, ^a Chuanjin Su, ^a Zihao Qin, ^d Ahmet Alatas, ^e Martin Kunz, ^f Takahiro Yamada, ^d Shelly D. Kelly, ^d Marty H. Upton, ^d Anthony Gironde, ^d Jiyong Zhao, ^e Bora Kalkan, ^e Wanli Yang, ^g Toshihiro Aoki, ^a Yongjie Hu.

Organisation

^a Department of Mechanical and Aerospace Engineering, University of California, Los Angeles, Los Angeles, CA, USA.

^b Department of Materials Science and Engineering, University of California, Irvine, CA, USA.

^c Physical and Computational Sciences Directorate, Pacific Northwest National Laboratory, Richland, WA, USA

^d Advanced Photon Source, Argonne National Laboratory, Argonne, IL, USA

^e Advanced Light Source, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.

^f Institute of Multidisciplinary Research for Advanced Material, Tohoku University, 2-1-1 Katahira, Aoba-ku, Sendai, Japan

^g Irvine Materials Research Institute, Irvine, CA, USA.

Full article at: <https://www.science.org/doi/10.1126/science.aeb1142> for more information.

Abstract

Efficient heat dissipation is fundamentally limited by intrinsic scattering mechanisms that cap the thermal conductivity of metallic materials such as copper to ~400 watts per meter-kelvin. Here we report the experimental realization of single-crystalline θ -phase tantalum nitride (θ -TaN), a metastable transition metal nitride predicted to overcome this limitation. We measured a room-temperature thermal conductivity of ~1100 watts per meter-kelvin, nearly three times that of copper. Synchrotron-based inelastic x-ray scattering revealed a distinctive phonon band structure with a large acoustic-optical gap and phonon bunching, which suppress phonon-phonon scattering. Ultrafast optical spectroscopy confirmed exceptionally weak electron-phonon coupling and validated first-principles calculations. These findings redefine the thermal transport limits of metallic materials and open new opportunities for advancing thermal management in electronics and power systems.

Effect of the Dielectric Treatment on Anomalous Charge Current in Polymer Tantalum Capacitors

Authors: ^a Y Freeman, ^b A. Gladkikh, ^c W.R. Harrell, ^d I Luzinov

Organisation

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Full article at: https://www.researchgate.net/publication/392748781_Effect_of_the_Dielectric_Treatment_on_Anomalous_Charge_Current_in_Polymer_Tantalum_Capacitors

Abstract

The effect of heat treatment of the dielectric, in air and an inert atmosphere, on anomalous charge current (ACC) and other electrical characteristics of middle-voltage range Polymer Tantalum capacitors was investigated. Chemical composition of the dielectric after the initial formation, heat treatment, and final formation was analyzed by secondary ion mass spectrometry (SIMS) performed on anodized tantalum foils with identical formation and heat treatment as the finished capacitors. Major reduction in ACC was observed in capacitors manufactured with heat treatment in an inert atmosphere, while significant ACC was observed for heat treatment in air. SIMS analysis showed significant differences between the dielectrics after heat treatments in air and in an inert atmosphere. These differences were related to Phosphorus incorporation in the external layer of the dielectric in the form of molecules of tantalum oxyphosphate during the formation of the tantalum anodes in a phosphoric electrolyte. Based on results of electrical testing and SIMS analysis, a possible mechanism of the effects of heat treatments on ACC in middle-voltage range Polymer Tantalum capacitors is presented. This mechanism is related to redistribution of tantalum oxyphosphate molecules in the external layer of the dielectric and its effect on the potential barrier at the dielectric-polymer interface.

The Crystallographic Evolution Behavior of Tantalum sputtering blank during Heat Treatment

Authors: ^a Dongliang Ge, ^b Zhaobo Li

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Abstract

For semiconductor tantalum sputtering blanks used in integrated circuits, the uniformity of microstructure and texture must be precisely regulated. The proportion of {111} and {100}-oriented grains in the tantalum blanks is the key factor that directly dictates the sputtering rate of the targets. In this work, the crystallographic characteristics of the tantalum sputtering blank after plastic deformation were characterized, and then quasi-in situ EBSD was employed to investigate the recrystallization behavior of {111} and {100}-oriented grains during annealing. The results show that most grains tend to nucleate near the {111} deformed matrix at the {111}-{100} interfaces in the early stage of recrystallization. The {111}-oriented matrix is consumed preferentially. The pole figure shows a trend of initial intensity decrease followed by an increase, while the intensity of {100}-oriented grains increase. However, the intensity of {100}-oriented grains significantly decrease at the end of recrystallization. With their lower dislocation density, {100}-oriented grains mainly migrate towards the higher dislocation density of {111}-oriented grains through a strain-induced grain boundary migration mechanism. The {111}-oriented grains possibly nucleate via a sub-grain coarsening mechanism. As temperature rises, some {100}-oriented grains are easily engulfed by {111}-oriented grains, leading to the aggregation of {111}-oriented grains.

Biomedical titanium-tantalum alloys for orthopedic implant applications: From manufacturing to biological performance

Authors: ^a SD Luo, ^a S Paisansuthichol, ^a N Tran, ^b M Qian, ^a T Song

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Full article at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC12969444/>

Abstract

An ideal biomedical material for orthopedic implant applications is characterized by being biologically compatible with the human body, mechanically matching human cortical or cancellous bones, and releasing no cytotoxic ions over its servicing time. Titanium-tantalum (Ti-Ta) binary alloy is such a potential biomaterial that is composed of the most biocompatible metal elements, and both metals have been heavily used as implant materials in clinical surgeries for decades. Additive manufacturing (AM) enables the innovative design of patient-specific medical implants, e.g., Ti-Ta lattices which display unique mechanical and biological properties. Such Ti-Ta lattice implants can best mimic the mechanical properties of natural bones and offer open pores and pore networks to promote implant-bone biological interactions, which are essential to successful and long-term implantation. This article extensively reviews the biomedical Ti-Ta alloys. It starts with a brief overview of Ti-Ta alloy development, then elaborates on its manufacturing, the resulting microstructures pertinent to cooling conditions, mechanical properties, and surface modification to improve the bioactivity. Ti-Ta lattices from AM process are particularly highlighted as they enable elastic moduli close to those of natural bones. Next, the corrosion resistance and wettability of Ti-Ta alloys are addressed. Last, the biological responses of Ti-Ta alloy in vitro and in vivo are scrutinized and discussed, highlighting the significance of the biocompatible Ti-Ta chemistry, the surface features and the AM-enabled lattice structures. This paper aims to establish a comprehensive and systematic understanding of binary Ti-Ta alloys for biomaterials research and artificial bone implant applications.

Keywords: Ti-Ta alloy, Biomaterial, Additive manufacturing, Lattice structure, Biological response.

A single-phase epitaxially grown ferroelectric perovskite nitride

Authors: ^b Songhee Choi, ^b Qiao Jin, ^a Xian Zi, ^b Qiao Jin, ^b Dongke Rong, ^c Jie Fang, ^c Jinfeng Zhang, ^b Qinghua Zhang, ^d Wei Li, ^b Shuai Xu, ^b Shengru Chen, ^b Haitao Hong, ^b Cui Ting, ^b Qianying, ^e Gang Tang, ^b Chen Ge, ^b Can wang, ^b Zhiguo Chen, ^d Lin Gu, ^d Qian Li, ^c Lingfei Wang, ^f Shanmin Wang, ^a Jiawang Hong, ^b KulJuan Jin, ^b Er-Jia Guo

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Full article at: <https://www.science.org/doi/10.1126/sciadv.adu6698>

Abstract

The integration of ferroelectrics with semiconductors is crucial for developing functional devices, such as field-effect transistors, tunnel junctions, and non-volatile memories. However, the synthesis of high-quality single-crystalline ferroelectric nitride perovskites has been limited, hindering a comprehensive understanding of their switching dynamics. Here we report the synthesis and characterizations of epitaxial single-phase ferroelectric cerium tantalum nitride (CeTa₃N₃) on both oxides and semiconductors. The polar symmetry of CeTa₃N₃ was confirmed by observing the atomic displacement of central ions relative to the center of the TaN₆ octahedra,

as well as through optical second harmonic generation. We observed switchable ferroelectric domains using piezo response force microscopy, complemented by the characterization of square-like polarization–electric field hysteresis loops. The remanent polarization of CeTa₃N₃ reaches approximately 20 microcoulomb per square centimeter at room temperature, consistent with theoretical calculations. This work establishes a vital link between ferroelectric nitride perovskites and their practical applications, paving the way for next-generation information and energy storage devices.

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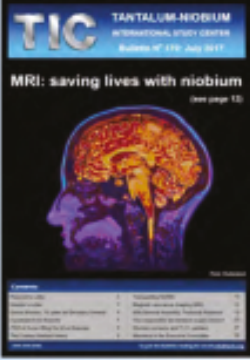








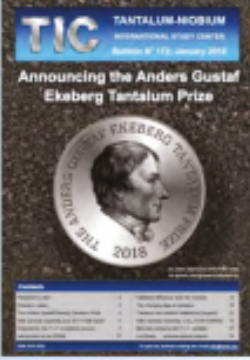




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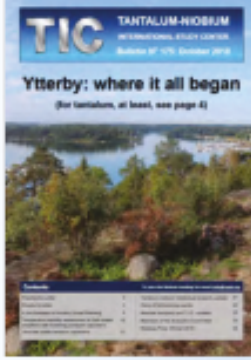
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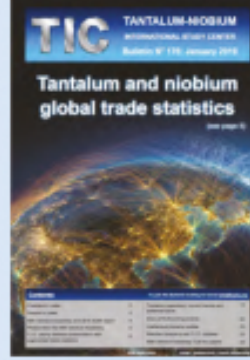












The Anders Gustaf Ekeberg Tantalum Prize: Winner 2026

Recognising excellence in tantalum research and innovation

The winning paper this year is:

Metallic θ -phase tantalum nitride has a thermal conductivity triple that of copper



Reasons given:

I am delighted to share with you the results of the panel's deliberations regarding the 2026 Ekeberg Prize.

The submitted papers were assessed against the following criteria:

- Novelty – originality of the approach, process, or invention.
- Quality of content – thoroughness of the research, precision of methods used, and clarity of presentation.
- Suitability & Applicability – relevance to the tantalum field, practical benefits to the supply chain, and accessibility for policymakers and the wider public.

All panel members submitted their evaluations, and following two rounds of discussion on the top four papers, we reached a consensus on the winner.

I am pleased to announce that the 2026 Ekeberg Prize is awarded to:

Metallic θ -phase tantalum nitride has a thermal conductivity triple that of copper

Authors: Suixuan Li, Chuanjin Su, Zihao Qin, Ahmet Alatas, Martin Kunz, Takahiro Yamada, Shelly D. Kelly, Marty H. Upton, Anthony Gironde, Jiyong Zhao, Bora Kalkan, Wanli Yang, Toshihiro Aoki, Yongjie Hu

Justification:

The selection of the paper on metallic θ -phase tantalum nitride as the winner of the Ekeberg Prize 2026 is a testament to its extraordinary scientific impact. The research demonstrates a thermal conductivity of approximately 1100 watts per meter-kelvin, nearly three times that of copper, a world-record property in the field. This achievement is substantiated by rigorous validation through synchrotron inelastic X-ray scattering, ultrafast spectroscopy, and first-principles theory, published in a leading scientific journal. The potential applications of this material in thermal management for AI, power electronics, and other industries are vast, promising significant advancements in technology and industry. Although the current state of the material is limited to a single-crystal laboratory demonstration without a commercial production route, its future implications for tantalum demand and supply chains are profound. The board recognizes the paper's potential to drive innovation and its transformative impact on various sectors, justifying its selection for this prestigious award.

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All presentations will be held in the plenary room.

DAY
1

Monday 14 September 2026

Opening introductions and technical presentations

Session 1

New Member, ExCom and President Introductions

10:00 to 12:00

10:00 to 10:30

1

KEYNOTE

China Nonferrous Metals Industry Association (CNIA)

Speaker: Mr Ge Honglin

10:30 to 11:00

2

PRESENTATION

The Crystallographic Evolution Behaviour of Tantalum Sputtering Blank During Heat Treatment

Speaker: Mr Ge Dongliang , OTIC

11:00 to 11:30

3

PRESENTATION

Tantalum in Next-Generation AI Power Delivery: Technical Shifts, Cost Pressure, and the Advantage of Mg-Reduced High-Voltage Powder

Speaker: Dr Melanie Stenzel , Taniobis



Lunch, 12:00 to 13:00

Session 2

13:00 to 14:30

13:00 to 13:30

4

PRESENTATION

Rising Demand, Constrained Supply: Tantalum Market Dynamics in the Global Semiconductor Era

Speaker: Kyle Pronk , Project Blue

13:30 to 14:00

5

PRESENTATION

The AI Revolution: Opportunities and Challenges for Tantalum Polymer Capacitors

Speaker: Mr James Q. Chen , YAGEO Group



Coffee break, 14:00 to 14:30

Session 3

14:30 to 15:30

14:30 to 15:00

6

MARKET UPDATE

Argus Media's Tantalum Market Update

Speaker: Sian Morris , Argus Media

Day One Adjournment

DAY
2

Tuesday 15 September 2026

All presentations will be held in the plenary room

Session 4

09:00 to 10:00

09:00 to 09:30

7

KEYNOTE

Metallic θ -phase tantalum nitride has a thermal conductivity triple that of copper

Speaker: Yongjie Hu, Professor , University of California, Los Angeles (UCLA)

09:30 to 10:00

8

PRESENTATION

Leading the Future of Responsible Niobium: CBMM's Approach to Sustainable Value Creation

Speaker: Christianne Canavero , CBMM



Coffee break, 10:00 to 10:30

Session 5

10:30 to 12:00

10:30 to 11:00

9

PRESENTATION

Modernization of Nb Alloy Development, Learning from History

Speaker: Josh Pierce , ATI

11:00 to 11:30

10

PRESENTATION

Recovery of Sn, Ta and Nb from Mining and Metallurgical Brazilian By-products

Speaker: Dr Daniel Mapa Clemente , Resind Indústria e Comércio Ltda

11:30 to 12:00

11

PRESENTATION

Tantalum and Niobium for Medical Devices

Speaker: Jeffrey S. Slater , Fort Wayne Metals, LLC



Lunch, 12:00 to 13:00

Session 6

13:00 to 15:00

13:00 to 13:30

12

PRESENTATION

BLOOM Project: Advanced Liberation Analysis for More Efficient Extraction and Processing of Critical Raw Material

Speaker: Marko Komac , INTRAW

13:30 to 14:00

13

PRESENTATION

Full-Chain Fabrication and Performance Investigation of High-Purity Niobium Superconducting RF Cavities

Speaker: Mr Yang Xudong , OTIC

14:00 to 15:00

14

PANEL DISCUSSION

Emerging Technologies and the Rising Demand for Tantalum and Niobium

Participants: To be confirmed

67th GENERAL ASSEMBLY, TECHNICAL PROGRAMME ABSTRACTS

The following pages contain the abstracts for the technical sessions at GA67, presented in the order in which they will appear in the programme.

We are pleased to include contributions from experts and organisations from across the global tantalum and niobium industry. The technical programme provides an opportunity to share the latest research, developments and practical experience across the industry.

<https://tanb.org/ga67-technical-programme/>

1: Opening speech at the 67th TIC General Assembly, China Nonferrous Metals Industry Association

Speaker - Mr Ge Honglin, Professor-level Senior Engineer, China Nonferrous Metals Industry Association

The 67th General Assembly will be held in Yinchuan. The speech summarized the development achievements of China's non-ferrous metal industry in 2025, with annual production, revenue, and profits all setting new historical records. The overseas resource layout continued to be optimized, and the rapid growth of the new energy industry significantly drove the demand for rare metals such as tantalum and niobium. Currently, geopolitical conflicts and trade protectionism are exacerbating fluctuations in the global industrial chain. Given the uneven geographical distribution of tantalum-niobium resources and the deep interdependence of upstream and downstream industries, it is advocated that countries deepen open collaboration, jointly carry out technological research and development, and implement green and low-carbon development and ESG governance throughout the entire industrial chain. Yinchuan is a core industrial base for rare metals in China. The local leading enterprise has been deeply involved in the tantalum-niobium field for many years, with overall industrial strength ranking among the top in the world and key technological breakthroughs in multiple high-end specialty material fields. The industry will continue to make efforts in four directions: promoting the inclusion of tantalum-niobium in the strategic mineral list, establishing a unified carbon footprint accounting standard, building cross-border industrial cooperation channels, and jointly tackling core preparation technologies. It aims to work with colleagues in the industry worldwide to ensure the stability of the industrial chain and jointly promote the high-quality and sustainable development of the global tantalum-niobium industry.

2: The Crystallographic Evolution Behavior of Tantalum sputtering blank during Heat Treatment

Speaker - Mr Ge Dongliang, OTIC

For semiconductor tantalum sputtering blanks used in integrated circuits, the uniformity of microstructure and texture must be precisely regulated. The proportion of {111} and {100}-oriented grains in the tantalum blanks is the key factor that directly dictates the sputtering rate of the targets. In this work, the crystallographic characteristics of the tantalum sputtering blank after plastic deformation were characterized, and then quasi-in situ EBSD was employed to investigate the recrystallization behaviour of {111} and {100}-oriented grains during annealing. The results show that most grains tend to nucleate near the {111} deformed matrix at the {111}-{100} interfaces in the early stage of recrystallization.

The {111}-oriented matrix is consumed preferentially. The pole figure shows a trend of initial intensity decrease followed by an increase, while the intensity of {100}-oriented grains increase. However, the intensity of {100}-oriented grains significantly decrease at the end of recrystallization. With their lower dislocation density, {100}-oriented grains mainly migrate towards the higher dislocation density of {111}-oriented grains through a strain-induced grain boundary migration mechanism. The {111}-oriented grains possibly nucleate via a sub-grain coarsening mechanism. As temperature rises, some {100}-oriented grains are easily engulfed by {111}-oriented grains, leading to the aggregation of {111}-oriented grains.

3: Tantalum in Next-Generation AI Power Delivery: Technical Shifts, Cost Pressure, and the Advantage of Mg-Reduced High-Voltage Powders

Speaker - Dr Melanie Stenzel, Taniobis

The evolution of AI is the largest volume driver for the Tantalum demand. Tantalum plays a critical role in AI hardware not only through capacitors, but also in semiconductor fabrication, advanced packaging, and barrier materials that enable reliable high-density interconnects. As AI server architectures evolve toward 48 V distribution, higher switching frequencies, and on-package power delivery, the operating conditions for capacitors are changing significantly. Power delivery networks now face faster transients, higher local current densities, and increased emphasis on voltage rating and derating margins. While tantalum polymer capacitors remain essential in the most critical locations, sharp tantalum price increases may accelerate substitution where performance margins allow. At the same time, higher intermediate voltages increase the value of capacitors with robust voltage capability. Mg-reduced high-voltage tantalum powders provide a clear advantage, enabling capacitors with higher rated voltages, improved reliability, and attractive cost-performance balance, helping to sustain tantalum's relevance in next-generation AI server platforms.

4: Rising Demand, Constrained Supply: Tantalum Market Dynamics in the Global Semiconductor Era

Speaker - Kyle Pronk Project Blue

The semiconductor sector remains under close global scrutiny, as the rapid growth of generative AI applications and data centre expansion continues to drive demand for tantalum, particularly in capacitors and sputtering targets. Global tantalum consumption is estimated to have surpassed the peak observed in 2022, a period characterised by elevated demand linked to pandemic-driven work-from-home trends and unit replacements. While material trade disputes, such as those affecting rare earth elements and other critical minerals, have not yet extended to tantalum, the broader ecosystem remains subject to a range of structural constraints that limit the pace of supply expansion. Elevated tantalum demand has increased the need for new supply, whether from primary artisanal sources, as a by-product of lithium and tin production, or secondary recycling. While lithium-derived tantalum offers certain ESG advantages, it remains dependent on broader lithium market dynamics. Artisanal production continues to play a key role in the global supply landscape. However, regional conflict, primary supply disruptions, and demand volatility can challenge supply chain stability. Recycled material represents a critical component of the tantalum supply ecosystem. While recycling can help mitigate the impact of supply disruptions, it does not provide a long-term solution to meeting sustained demand. Project Blue estimates that tantalum demand for electronic applications will grow at a CAGR of 3.1% between 2024 and 2036, highlighting the need for increased recycling initiatives to offset supply constraints from primary sources.

5: The AI Revolution: Opportunities and Challenges for Tantalum Polymer Capacitors

Speaker - Mr James Q. Chen, YAGEO Group

Artificial intelligence is rapidly transforming computing infrastructure, reshaping the landscape for passive components and creating new opportunities and challenges for tantalum polymer capacitors. This presentation examines how AI-driven hardware architectures influence capacitor selection criteria, including capacitance density, ESR/ESL, ripple current capability, thermal stability, reliability, and volumetric efficiency. Particular focus will be placed on the role of tantalum polymer capacitors in GPU accelerator cards, AI server power delivery networks, and high-density voltage regulation modules. The presentation will further explore technology directions required for future competitiveness, including ultra-low ESR materials, high temperature reliability, surge robustness, advanced package design, and integration with next-generation power architectures. Finally, the broader implications for the tantalum supply chain and the global capacitor industry will be evaluated, highlighting both growth opportunities and strategic risks associated with the AI era.

6: Argus Media's Tantalum Market Update

Speaker - Sian Morris, Argus Media

The tantalum industry is going through a period of major upheaval as supply is more precarious than ever but downstream applications from artificial intelligence, aerospace, energy, and medicine are growing quickly. This market update will explore the global tantalum market, its growing strategic importance across advanced industries, and the greatest challenges the industry is facing. Tantalum demand is being shaped by powerful long-term trends, most notably the rapid rise of artificial intelligence. AI infrastructure, particularly data centres, depend on high-performance semiconductors and capacitors, while lead times for the industrial gas turbines used to power data centres are growing day by day. At the same time, the aerospace sector remains a critical demand driver with tantalum used in high-temperature superalloys for engines and turbine components. Continued growth in aviation and defence spending is reinforcing demand in this segment. But despite these strong demand trends, supply is constrained and fragile. Production is heavily concentrated in a small number of regions, particularly in Central Africa, which creates serious price volatility and traceability concerns. These structural constraints are driving greater price volatility and procurement risk, prompting companies to diversify their sourcing strategies and governments to manage supply more closely. This presentation will examine these trends and the impact they are having across the tantalum supply chain.

7: Metallic θ -phase tantalum nitride has a thermal conductivity triple that of copper

Speaker - Yongjie Hu, Professor, University of California, Los Angeles (UCLA)

Efficient heat dissipation is fundamentally limited by intrinsic scattering mechanisms that cap the thermal conductivity of metallic materials such as copper to ~400 watts per meter-kelvin. Here we report the experimental realization of single-crystalline θ -phase tantalum nitride (θ -TaN), a metastable transition metal nitride predicted to overcome this limitation. We measured a room-temperature thermal conductivity of ~1100 watts per meter-kelvin, nearly three times that of copper. Synchrotron-based inelastic x-ray scattering revealed a distinctive phonon band structure with a large acoustic-optical gap and phonon bunching, which suppress phonon-phonon scattering. Ultrafast optical spectroscopy confirmed exceptionally weak electron-phonon coupling and validated first-principles calculations. These findings redefine the thermal transport limits of metallic materials and open new opportunities for advancing thermal management in electronics and power systems.

8: Leading the Future of Responsible Niobium: CBMM's Approach to Sustainable Value Creation

Speaker - Christianne Canavero, CBMM

As global industries accelerate their transition toward a lower-carbon, more resilient future, the demand for responsibly produced materials has become increasingly important. Niobium is connected to key global trends such as electrification, the energy transition and decarbonization, enabling innovations that enhance efficiency, performance and sustainability in multiple sectors. In this context, responsible sourcing is emerging as a strategic differentiator throughout global markets and supply networks. This presentation will explore how CBMM integrates sustainability throughout the Niobium value chain, delivering products that combines quality, security of supply and a strong commitment to environmental, social and governance (ESG) practices. From responsible management of natural resources and continuous improvements in water and energy efficiency to community development, people-centered practices and supplier engagement, sustainability is embedded throughout the Company's operations. Supported by robust certifications, traceability systems, high standards of ethics and corporate governance, and a long-term approach to technological development, CBMM strives to generate lasting value for customers, communities and society while ensuring a resilient and reliable supply chain. The presentation will also highlight the importance of industry dialogue and collaboration in advancing credible and transparent approaches for the Niobium market, fostering a shared vision for responsible sourcing, innovation, supply resilience and sustainable growth across the industry.

9: Modernization of Nb Alloy Development, Learning from History

Speaker - Josh Pierce, ATI

Refractory metals and their alloys are important structural materials for elevated temperature environments. Despite extensive research during the mid-20th century, challenges in achieving a balanced set of properties, including fabricability and oxidation resistance, hindered the broad implementation of this alloy class. Recently, modern interest in these materials has been renewed by the refractory multi-principal element alloy (RMPEA) design philosophy and new processing pathways, such as additive manufacturing (AM), that enable their production. This presentation provides a critical comparison of the historical and modern approaches to refractory alloy design, examined through the lens of Nb-based alloys, and highlights overlaps between conventional refractory alloys and RMPEAs. Key areas discussed include conventional design rules for Nb-based alloys; the importance of processing in the successful adoption of new materials; and insights for designing alloys for AM that are derived from the welding literature. Knowledge gaps and opportunities to address them are identified.

10: Recovery of Sn, Ta and Nb from Mining and Metallurgical Brazilian By-products

Speaker - Dr Daniel Mapa Clemente, Resind Indústria e Comércio Ltda

Brazil hosts important reserves of strategic minerals such as Sn, Ta, Nb, W and rare earth elements, which commonly occur in complex ores. During the production of Sn, Ta and Nb, contaminants often remain associated with cassiterite concentrates even after mineral beneficiation. During cassiterite processing and tin smelting, Ta₂O₅ and Nb₂O₅ tend to concentrate in the slag phase due to their higher thermodynamic stability, creating an important secondary resource for critical metals recovery. Conventional reduction routes may concentrate Ta and Nb in tin slags but often do not eliminate the classification of these materials as class 7 products. Since 2000, Resind has focused on the recovery of critical metals from mining and metallurgical by-products, particularly complex Brazilian tin slags containing Ta₂O₅ and Nb₂O₅, as well as contaminants such as ZrO₂, rare earths, Al₂O₃, MgO, TiO₂ and CaO, which may collectively exceed 60 wt.%. Increasing slag complexity and compositional variability created important technical challenges for the recovery of Sn, Ta and Nb from these secondary resources. Between 2014 and 2026, Resind participated in collaborative research with Brazilian and German institutions, resulting in 13 scientific publications. This article reviews and consolidates these studies, which supported the subsequent industrial development of Ta and Nb recovery, addressing slag melting behavior, viscosity, basicity, fluxing agents, optimization of Sn recovery, Ta concentration mechanisms, metallic phases in tin slags, and segregation of Ta and Nb during solidification. Special attention was given to the influence of ZrO₂, Al₂O₃, TiO₂ and MgO on slag properties. These studies enabled the industrial development of a pyrometallurgical route for recovery of Ta and Nb from Brazilian tin slags, enabling the commercial production of non-class 7 FeTaNb alloys. More than 710t of contained Ta+Nb have been commercially produced in FeTaNb alloys over the last 5 years. The process has operated industrially since 2016 and demonstrates a scalable approach for valorization of metallurgical residues and circular recovery of critical metals.

11: Tantalum and Niobium for Medical Devices

Speaker - Jeffrey S. Slater, Fort Wayne Metals, LLC

Presenting a variety of Medical Device products utilizing Tantalum and Niobium and their applications... Discussing advantages of Tantalum and Niobium for use in Medical devices with strong corrosion resistance and radiopacity along with electrical properties. Comparing volume for Medical Device Industry vs other industrial applications.

12: BLOOM Project: Advanced Liberation Analysis for More Efficient Extraction and Processing of Critical Raw Material

Speaker - Marko Komac, INTRAW

Funded under Horizon Europe, the BLOOM project aims to improve the efficiency, sustainability and economic viability of mineral extraction and processing through a modular analysis system centred on innovative Mineral Liberation Analysis (MLA). This system is designed to provide near real-time mineralogical information, supporting better process monitoring, adaptive control and operational decision-making. Since its launch, BLOOM has made significant progress in the characterisation of mineral resources by combining particle-size distribution, chemical analysis and advanced mineralogical techniques. This work improves understanding of mineral liberation and associations, which is essential for optimising grinding and flotation processes. The project has also advanced the development of the modular system, mineralogical databases, KPIs, techno-economic assessment tools and integration requirements for industrial sensor deployment. Its central element is a containerised pilot plant that combines advanced sensing, automation and control. This will validate the MLA-based approach under representative conditions and support its transition from laboratory testing to industrial application. BLOOM works with mining projects in Canada and Ukraine focused on tantalum and niobium, as well as operating polymetallic mines in Canada and Spain. By integrating mineralogical data into processing workflows, the project aims to improve recovery, stabilise product quality, reduce energy use and support more sustainable critical raw materials supply chains in Europe. The consortium of 14 multidisciplinary partners includes research organisations, technology providers and mining companies from four EU countries, as well as Ukraine, Canada and Brazil, one of the world's resource-rich countries. The project is coordinated by UPC.

13: Full-Chain Fabrication and Performance Investigation of High-Purity Niobium Superconducting RF Cavities

Speaker - Mr Yang Xudong, OTIC

High-performance superconducting radio frequency (SRF) cavities are at the heart of modern high-energy accelerators. This paper presents a comprehensive, full-chain technological framework for the fabrication of 1.3GHz high-purity niobium nine-cell SRF cavities, spanning from microscopic material purification to macroscopic cavity manufacturing. Leveraging a synergistic approach combining hydrometallurgical separation and electron beam melting, the critical bottleneck in synthesizing ultra-high-purity niobium ingots with a residual resistivity ratio (RRR) exceeding 680 has been successfully overcome. By employing low strain-rate cold working and micro-planarization electropolishing (EP), niobium sheets were engineered to preserve a high-fidelity RRR (> 620) while achieving an ultra-smooth surface finish ($R_t < 10 \mu\text{m}$). Through the subsequent integration of precision forming, defect-free high-vacuum electron beam welding, and mid-temperature heat treatment, over 100 1.3GHz-type nine-cell cavities were mass-produced and systematically evaluated. Cryogenic vertical tests reveal that the cavities achieve an average accelerating gradient of 28.4 MV/m, with a median unloaded quality factor (Q_0) 4.3×10^{10} at 20 MV/m. This fully autonomous and scalable manufacturing system lays a crucial technological foundation and provides production capacity for next-generation advanced light sources and large-scale collider facilities.

14: Emerging Technologies and the Rising Demand for Tantalum and Niobium

Panel discussion - participants to be confirmed

New members

Corporate membership of the T.I.C. is open to organisations actively involved in any aspect of the niobium and tantalum industries, from explorers to miners, traders and processors, through to end users and suppliers of goods and services to the industry. Associate membership is available to organisations that are not commercially involved in our industries, such as academia, associations, government bodies and civil society.

Bluecap Resources Ltd

Address: Goldfields House, 18a Gold Tops, Newport, NP20 4PH
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Activity Recycling



Encounter Resources Ltd

Address: Suite 2, 1 Alvan Street, Subiaco 6008, Perth, Western Australia
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Activity Mining



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Activity NGO



Jiangxi Suns Nonferrous Materials Co., Ltd

Address: Dongxing Road, High tech Industrial Development Zone, Xinyu City, Jiangxi Province, China
Email: 571419645@qq.com
Activity Processing Ta, Smelter



Kinabalu Enterprise Ltd

Address: Rm 05, 11/F Global Gateway, Tower 61-63 Wing Hong St, Cheung Sha Wan, Hong Kong
Email: Info@kinabaluresources.com
Website: www.kinabaluresources.com
Activity Trading, mining and processing



Minexx Ltd

Address: C/O Sovereign Trust (Mauritius) Limited, Unit 21 Circle Square Business Park, Forbach, Mauritius
Email: laurent@minexx.co
Website: n/a
Activity Trading



Diary of industry events

October 2026

London Metal Exchange (LME) Week 2026 — 19–22 October 2026, London, UK

<https://www.lme.com/events/lme-week>

International Mining and Resources Conference + Expo (IMARC) 2026 — 27–29 October 2026, Sydney, Australia

<https://imarcglobal.com>

November 2026

Electronica 2026 — 10–13 November 2026, Trade Fair Center Messe München, Munich, Germany

T.I.C. will have a trade stand at the event.

<https://electronica.de/en/trade-fair/>

53rd Meeting of the Transport Safety Standards Committee (TRANSSC) — 16–20 November 2026, Vienna, Austria

Formnext 2026 — 17–20 November 2026, Messe Frankfurt, Frankfurt am Main, Germany

<https://formnext.mesago.com/>

Responsible Business Alliance (RBA) & Responsible Minerals Initiative (RMI) Annual Conference 2026 — 17–19 November 2026, San Jose Convention Center, San Jose, California, USA

<https://www.responsiblebusiness.org/>

December 2026

IAEA Denial of Shipment Working Group — 7–11 December 2026, Vienna, Austria

February 2027

Mining Indaba – African Mining Conference 2027 — 8–11 February 2027, Cape Town, South Africa

<https://miningindaba.com/>

April 2027

RAPID + TCT 2027 — 12–15 April 2027 (conference); 13–15 April 2027 (exhibition), Huntington Place, Detroit, Michigan, USA

<https://www.rapid3devent.com/>

MMTA International Minor Metals Conference 2027 — 12–14 April 2027, Seoul, South Korea

<https://mmta.co.uk/event/mmta-international-minor-metals-conference-2027/>

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LARGE SCALE Industry Leader

- Global No.1 in tantalum oxide capacity
- Global No.1 in tantalum metal capacity
- Global No.2 in niobium oxide capacity
- Global No.2 in niobium metal capacity

Five production bases in China with targeted capacity expansion to ensure long-term growth and reliable supply.



FULL INDUSTRY CHAIN Integrated and Complete

- Covering the full value chain from hydrometallurgy and pyrometallurgy to high-purity oxides, metals, alloys and fabricated products.
- Continuous innovation in key products such as 6N high-purity tantalum and 5N high-purity niobium

One-stop solutions to meet diverse customer needs.



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- Adhering to the highest EHS standards with ISO 14001 & ISO 45001 certified.
- Member of TIC, ITSCI and MMTA.
- Committed to conflict-free supply chain and sustainable development.

Stable operations, strict quality control and customer-centric service for a secure and trustworthy partnership.

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Ta₂O₅



Nb₂O₅



Tantalum
Powder



Niobium
Powder



Tantalum
Ingot



Niobium
Ingot



Tantalum/Niobium
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- ◆ Certified to CFSI annual audit successively since 2011
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- ◆ The earliest TIC member in China and an Asian member of the TIC Executive Committee
- ◆ Executive member of Ta & Nb Branch of the China Nonferrous Metal Industry Association
- ◆ The Chinese National Ta & Nb Special Metal Material Engineering Technology Research Center
- ◆ Standardization leader of the tantalum and niobium industry in China

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