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TANTALUM-NIOBIUM INTERNATIONAL STUDY CENTER

PRESIDENT'S LETTER

I hope that by the time you read this Bulletin, you have already registered for the Forty-fifth General Assembly in Philadelphia. There will be details regarding the meeting included in this Bulletin.

We have an outstanding line up of papers to be presented and I trust all delegates will find several of interest. Bill Serjak will update the membership on the continuing work of the T.I.C. Transport Committee. I think you will be pleased with the work to date. This committee's work will continue into and possibly through next year.

The social activities promise to be very exciting and even educational as Philadelphia holds an important place in U.S. history. Let's hope for good weather.

On behalf of the T.I.C., I would like to express our appreciation to Reading Alloys for inviting delegates to their plant for a tour on Tuesday.

I look forward to seeing you soon in Philadelphia. And lastly, don't forget to submit papers for the Symposium in 2005.

Dave Reynolds
President

CONTENTS

SYMPOSIUM IN 2005
In October 2005, in Thailand, the T.I.C. will hold its next international symposium on tantalum and niobium.
Please submit your proposals for papers to the secretariat as soon as possible. We look forward to hearing from you.

GENERAL ASSEMBLY, PHILADELPHIA

Philadelphia is the city selected by the T.I.C. for its Forty-fifth General Assembly in October 2004, so that a field trip to the metallurgical plant of Reading Alloys can be included in the programme.

The formal General Assembly of the members to carry out the business of the association will be held on the morning of Monday October 11th. Revision of the Charter is necessary to bring the statutes of the association into line with the Belgian law governing international associations, as this has recently been revised. The purpose and activities of the association are unchanged.

Sessions of technical presentations will complete the programme for the morning and afternoon of Monday, the abstracts of the papers are shown below. The plant tour of Reading Alloys will take place on Tuesday October 12th.

A reception on the evening of Sunday October 10th will open the meeting, and on the evening of Monday all delegates and guests and their ladies are invited by the T.I.C. to a gala dinner. Accompanying persons have their own programme of sightseeing tours, with a guided tour of the historic sites of Philadelphia on Monday and a trip to Longwood Gardens on Tuesday, as well as a special social event on Sunday afternoon just for them.

TECHNICAL PROGRAMME ABSTRACTS

Review of the year, and a report on the work of the T.I.C. Transport Committee
William A. Serjak, Technical Promotion Officer
Tantalum-Niobium International Study Center

The events of the past year in the industry will be reviewed, with the statistics collected and estimated by the T.I.C. A progress report on the work of the Transport Committee, and the possible disturbance to the supply chain by the changes in regulations on carrying tantalite raw materials, will be included.

The Defense National Stockpile Center's tantalum sales from 1997 through the present
The Administrator of the Defense National Stockpile Center
Defense Logistics Agency, Defense National Stockpile Center

The paper will detail current sales processes and the levels of sales for this period of time.

Tantalum powders for high voltage applications
Leah F. Simkins, Michael J. Albarelli, Kathleen B. Doyle and Bonnie Cox
H.C. Starck

A well-known phenomenon associated with high voltage growth of an anodic oxide film on a valve metal is dielectric breakdown. There are many other factors that influence the performance of a material in high voltage capacitors. Over the past 50 years, there have been numerous investigations of dielectric breakdown during anodization, but there have been few investigations into characterizing a material for high voltage performance. This paper will discuss limitations of high voltage tantalum powders, and what characteristics optimize high voltage performance in both solid and wet capacitors.

Niobium for high-temperature applications
Tadeu Carneiro, Vice President
Reference Metals Company, Inc., Bridgeville, PA, USA

Niobium has been present in every major development involving materials for high temperature applications. Niobium and its alloys continue to be viewed by the scientific community as an important resource to respond to the new challenges involving high temperature materials. This paper reviews the main areas where niobium is used as a high temperature material and the future prospects for each one of these areas. This includes nickel-base superalloys, niobium-base alloys and gamma titanium aluminides containing niobium.

Recent advances in tantalum mill products for physical vapour deposition
Peter Jepson, Rich Malen and Prabhat Kumar
H.C. Starck

Tantalum thin films have been used in ink jet printing for over a decade. An emerging technology is the use of tantalum thin films as a diffusion barrier layer under copper interconnects in integrated circuits. H.C. Starck Inc. has worked since 2000 to establish itself as the technology leader in the supply of plate for this application. In so doing, research to understand the effects of the properties of the plates on the thin film was needed, as well as development of manufacturing processes, which would consistently produce top-quality products at a competitive price. Innovative R&D techniques (for example: Finite Element Modeling and Electron Back-Scattering Diffraction) will be described, as well as the important features of the products which have been launched since 2002, including purity control and crystallographic texture control.

We believe that the current state of the art products will meet the technical requirements of this interesting application. Our future efforts will be directed at reducing the cost of ownership through technical innovations.

The usage of tantalum for physical vapour deposition applications
Michael W. Morris
Cabot Supermetals

Tantalum has been used for over twenty years to produce thin metal films through the process of physical vapour deposition or sputtering. This talk summarizes the history of tantalum in these applications, including the performance criteria that led to the selection of tantalum, and concludes with a look at the present growth areas for tantalum in thin films applications.

Some problems of yttrium-refined tantalum production
S. Dobrussin, Yu. Gulyaikin, G. Gyintsev, V. Shevlyakov
NAC Kazatomprom, Ulba Metallurgical Plant JSC

A prospective method of upgrading tantalum resistance to higher temperatures is refining with yttrium at 2 to 50 ppm. Yttrium contained in tantalum is distributed at the grain boundaries, it keeps the latter from migration and, consequently, impedes abruptly the grain growth during collective re-crystallization.

This paper discusses some problems of the production of yttrium-refined tantalum metal and products.

The paper demonstrates methods of introducing yttrium into the metal. It appears that the best method is introduction of yttrium upon producing ingot by vacuum arc skull melting. The process is conducted with the consumable electrode (made of electron beam melted tantalum), while a portion of metal is in the molten pool for reloading. Yttrium (as oxide or metal) is loaded on to the bottom of the molten pool and gets into the molten metal at the final melting stage. The benefit of this method is that a significant portion of added yttrium remains in the molten metal, the latter is mixed in the pool by the magnetic field and is evenly distributed within the whole metal volume. Besides, upon discharge into the crystallizer the metal is additionally mixed. Crystalline structure of skull-melted ingot differs in rather fine and consistent grain as compared with the structure of EB melted ingot.

For further deformation of ingot into finished forms such as sheet, strip, rod and wire, proper selection of thermal and mechanical treatment conditions is critical to produce fine crystalline structure. The process diagram must provide for alternation of deformation and complete re-crystallization annealing operations. During each annealing cycle the grains are ground and yttrium is re-distributed at the boundaries of new grains. Therefore it is important to have several such cycles. Proper conditions of thermal and mechanical treatment conditions allow the production of finished products with upgraded resistance to higher temperatures, and prevent premature destruction. This presentation discusses also some peculiarities of production of yttrium-refined tantalum (as sintering tray, furnace heater, wire, etc.) with upgraded resistance to higher temperatures.

Tantalum coated materials for surgical implants
Bo Gillesberg
Danfoss A/S

Tantalum has for decades been used as implant material for a number of applications including fracture repair, dental applications, in the repair of cranial defects and as vascular stents and other applications. In spite of a superior biological response, the use of tantalum for load bearing implants has been limited due to a high density and relatively poor mechanical properties of the metal. By applying tantalum as a coating on materials like stainless steel, CoCrMo alloys and carbon materials it is possible to combine desired properties of the substrate with a surface of surgical grade tantalum, revealing new markets and applications for tantalum.

Tantalum coating on metal substrates such as stainless steel and CoCrMo alloy makes heavy load-bearing tantalum implants available by combining a high strength core with a diffusion barrier of tantalum. Further tantalum coating improves the fatigue strength of the substrates by up to 60% compared to uncoated material. Implantation of tantalum coated devices shows a bone ingrowth rate significantly better than titanium.

Tantalum coated carbon-carbon composite cages for spinal fusion offer excellent bone ingrowth and inherent X-ray marking while the desirable properties of the C-C substrate are preserved (strength, toughness, low E-modulus, and radiolucence). Implantation confirms adequate strength, biocompatibility, bone ingrowth and compatibility with radiology and CT-scanning, both producing clear images of the implant and the bone inside.

Challenges involving deposition of counter-electrode systems in high charge (≥100k CV/g) tantalum powders
Eric Zediac, Chris Coker, John Moore
KEMET Electronics

This paper will deal with the physical and chemical constraints involved in depositing an MnO_2 or polymer counter-electrode layer on tantalum anodes made from high charge tantalum powders - ≥100k CV/g. Various process methods and materials modifications will be discussed to demonstrate how this can be accomplished. Electrical testing results as well as SEM physical evaluations will be presented.

How far can we go with high CV tantalum capacitors?
Yuri Pozdeev Freeman
Vishay Sprague

Miniaturization, increasing volumetric efficiency CV/cc, is a constant trend for all electrical capacitors. Different types of capacitors have different ways to increase CV/cc. For instance, in multi-layer ceramic capacitors CV/cc has been increasing by using ceramic with higher dielectric constant, reducing the thickness of the ceramic layer, and increasing number of the layers. In other words, the MLCCs can exercise three degrees of freedom to increase their CV/cc. In contrast to that, tantalum capacitors have virtually only one degree of freedom, which is the powder morphology. Using finer powder with smaller prime particle allows an increase in specific surface area of the powder, and thereby makes a higher CV/cc of finished capacitors. First solid tantalum capacitors were made with less than 10 000 µC/g powder, while modern tantalum capacitors are made with up to 150 000 µC/g powder, and powder makers are working on further increasing the powder CV. The problem is that the powder CV is achieving a critical value, where further increase in the specific surface area does not result in higher CV at any formation voltage. The critical CV also results in the situation where the CV of the solid capacitor cannot reach the same level as the powder CV, as tested in a wet cell. In this case, the loss of CV in the solid capacitor is usually accompanied by high DCL, poor AC characteristics, and high failure rate.

The current paper describes physical phenomena responsible for the critical CV, including size effects when prime particle becomes comparable with the thickness of the anodic oxide film on tantalum and thickness of the natural oxide film on the particle surface. The analysis will be done on the maximum powder CV, maximum and minimum formation voltage for given powder CV, and maximum capacitance in given volume.

TANTALUM CHIP CAPACITORS IN THE AUTOMOTIVE ARENA

This article is based on the paper given by Mr Martin Rudert, responsible for the purchase of electronic devices as the Purchasing Manager of the Automotive Division of Bosch, at the T.I.C. meeting in Lisbon, October 2003.

For more than a century the name 'Bosch' has been associated with forward-looking technology and inventions that have made history. Bosch does business all over the world, with 236 locations worldwide.

Automotive Technology represents the largest area of corporate activity within the Bosch Group. The division 'Automotive Electronics' has its headquarters in Reutlingen, Germany, and develops, produces and sells all types of microelectronic products. Other core competencies are systems integration and automotive applications.

Bosch is the world's second largest supplier to the automotive industry. It has grown strongly in recent years, and has succeeded in pioneering innovations and in developing a global network of customers and suppliers.

The company was started in the 19th century in Stuttgart, and by 1886 had about 50 000 employees. Today the employees number more than 220 000, and in 2001 the company's revenues were more than 35 billion euros. The growth of Bosch was always in parallel to that of the car industry.

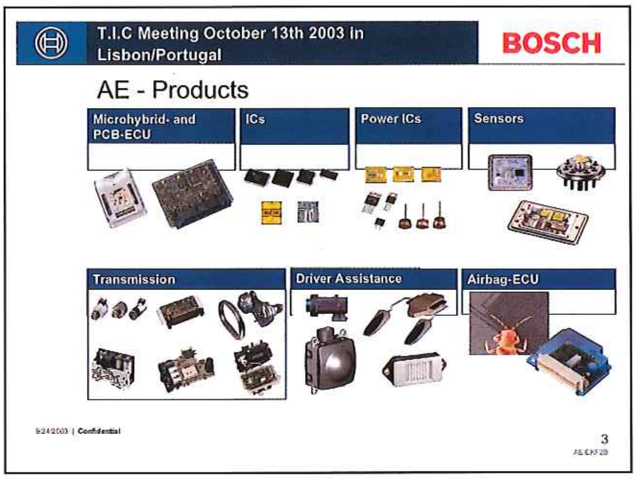

Figure 1: Some automotive electronic products

Automotive electronics are found in powertrain systems, energy management, comfort and safety applications, body and convenience applications and driver information systems. Electronic products such as electronic control units or sensors contain tantalum capacitors. So demand for tantalum capacitors in the automotive arena is related to the production of automobiles. In 2002, about 57 million cars were produced in the world: at an annual calculated growth rate of 1.8%, about 62.4 million will be produced in 2007, and more than 65 million in 2010.

Region	2002	2007
Total no. automobiles	56.6 million	62.4 million
	%	%
Europe	35.7	36.1
Americas	32.8	32.2
Japan	17.9	15.0
Asia/Pacific	13.6	16.7

Table 1: Automobile production, percentage by world regions

But it is not only the increase in car production that influences the demand for electronic components. Even stronger growth is shown by the sales figures for automotive electronics – here annual growth of 6% to 7% can be seen, with sales of $32.5 billion in 2002 forecast to rise to $44.6 billion in 2007.

The proportion of the production cost of a car which is represented by the electronics is increasing: whereas in 1985 electronics' share of production value of an average car was less than 5%, in 2005 that share is expected to be above 20%. This growth in demand affects the producers of tantalum capacitors and, in turn, their suppliers.

The level of equipment fitted in cars is growing year by year. In 1990 there were only applications in power steering, central locking systems and air conditioning, with a low demand for anti-braking systems, but today there are many new applications, such as airbags, and the general demand for all these applications is increasing. The use of this sophisticated equipment is diffusing from luxury cars to more widespread use in less expensive cars. In October 2003 there are around 55 electronic control units in a luxury class car, but there is a trend towards fitting this equipment also in more moderate cars. This effect is emphasised in periods of low car production, as competition obliges the manufacturers to provide more benefits to customers in order to sell their particular brand.

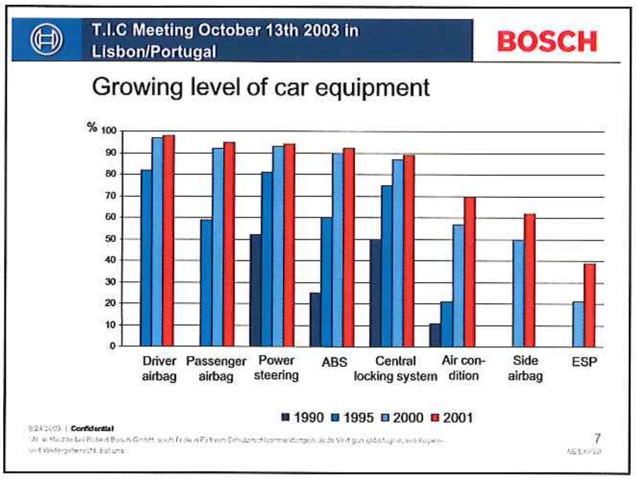

Figure 2: Growing level of car equipment

Technical information

Besides general trends such as downsizing and improvement of electrical parameters, there is a trend to higher temperatures, for example, operation at an ambient temperature of 175°C for transmission control units. Quality requirements are also rising, for example the target failure rate for tantalum capacitors is 20ppb/year, and a lifetime of 17 years is required for battery management systems.

Looking at the temperature in a car, components must be able to function at 85°C inside the car, as for navigation systems the surroundings may reach this temperature. In some applications even higher temperature profiles can be seen – 150°C, 200°C or even above 300°C. Increased packing density on the substrate goes along with miniaturisation of the electronic control unit, and there are new functions of electronic power applications, such as steering and engine cooling. The increased temperature requirements in turn lead to new technologies to connect the components electrically. The systems have to be cooled, or new electronic components which tolerate the high temperatures are needed.

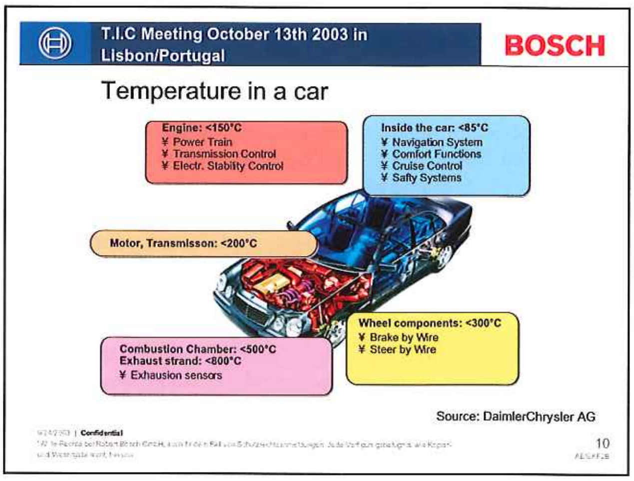

Figure 3: Temperature in a car (source: Daimler-Chrysler AG)

For success in the automotive market, quality is an important issue. Bosch has six Quality Principles:

1. Our goal is to fully satisfy our customer's expectations through the quality of our products and services.
2. Quality and Quality improvement is every associate's responsibility and ultimate goal – from the board of directors to apprentices. (Everyone must be involved.)
3. Our directives, processes, systems and goals are based on requirements from international standards, customer expectations, our knowledge and experience. Knowledge of and compliance with these directives and processes is the foundation of our quality.
4. Quality means 'doing the detail' from the beginning, thus preventing failures in the end. Continuous development of the quality of processes lowers costs and increases productivity. (To do it correctly from the beginning lowers costs and increases productivity.)
5. Avoiding failures is more important than eliminating defects. We apply methods and tools for preventive quality assurance systematically, learn from mistakes and eliminate their root causes without delay.
6. Our suppliers contribute substantially to the quality of our products and services. Therefore our suppliers must live up to the same high quality standards we have adopted.

These quality goals are important to Bosch because (according to data from ADAC) about 35% of all car breakdowns are caused by electronics. Other causes are ignition problems (14%) and motor problems (10.5%). In society a discussion concerning the bad performance of electronics in cars has already started, so every supplier in the automotive arena has to improve quality. A better image of electronics in automobiles is needed. Better quality makes a company more competitive, and thus brings increased demand and turnover. A study by McKinsey showed that profits rose when quality was improved. This can be achieved by eliminating the costs involved with problems arising from poor quality, such as complaints, sorting, reworking, exchanges and recall campaigns. Hence the market position can be strengthened.

The history of Bosch is an example of success in the automotive business.

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The T.I.C. is an *association internationale* under Belgian law.

NIOBIUM CRYSTAL™

This paper was written by A.T. Pereira and A.D. Menezes, Companhia Brasileira de Metalurgia e Mineração (CBMM), and F.W. Strauss and D. Silva, Cristallerie Strauss, and presented at the T.I.C. meeting in 2003 by Mr Antonio Telhado, CBMM.

The objective of niobium use in the production of crystal tableware and decorative objects is the manufacturing of new types of glass with the same characteristics as lead crystal (crystal containing 24% PbO), without the health and environmental problems associated with the use of lead. In the formulation of 'Niobium Crystal™' niobium entirely substitutes lead. Results from analyses show that the 'Niobium Crystal™' is more resistant than the lead crystal to corrosive agents such as dilute solutions of hydrochloric acid and sodium hydroxide. They also show the same characteristic brilliance as lead crystal and can be easily cut and engraved at moderate temperatures. (Figure 1) 'Niobium Crystal™' is thus an alternative to lead crystal.

Figure 1: 'Niobium Crystal™'

INTRODUCTION

As lead is toxic, research has been going on throughout the world in search of materials that can be used as substitutes for lead in the manufacturing of crystal. Niobium pentoxide (Nb_2O_5) is one of the candidates for this substitution, as it is inert and presents no handling risks. Moreover, niobium has the property of increasing the glass's refractory index (1), and is already being widely used in the manufacturing of special lenses in Japan and Europe.

Thus, the goal of this work is to study niobium added lead-free glass compositions, targeting materials with specific mass superior to 2.4 g/cm³, a minimum refractory index of 1.51, and highly resistant to chemicals.

This work was developed by CBMM (the world's largest niobium producer) in cooperation with Cristallerie Strauss (among Brazil's best crystal producers).

RESULTS AND REVIEWS

The 'Niobium Crystal™' tableware produced shows good transparency and homogeneity. Table 1 shows the physical properties for different 'Niobium Crystal™' and 'Lead Crystal' compositions.

Property	Niobium Crystal™ 1% Nb_2O_5	Niobium Crystal™ 4% Nb_2O_5	Lead Crystal 1	Lead Crystal 2
%Nb_2O_5	1	4	0	0
%PbO	0	0	24	24
(S.P.) °C	577	591	502	494
Tg °C	516	539	456	446
(CTE)x10^{-7}/°C [thermal expansion]	99.9	93.5	94.7	108.6
Specific mass (g/cm²)	2.7	2.8	3	3.1
Nd [refractive index]	1.51	1.548	1.548	1.556
Hardness (Hv) kgf/mm²	502	475	444	437

Table 1: Properties of Niobium Crystal

It can be seen from Table 1 that even the 'Niobium Crystal™' with only 1% Nb_2O_5 has a refractory index of 1.51 and a specific mass above 2.4 g/cm³. The 'Niobium Crystal™' with 4% Nb_2O_5 has a refractory index of 1.548 and a specific mass of 2.8 g/cm³. There is a slight drop in the thermal expansion coefficient values, which indicates that the 'Niobium Crystals™' may show improved resistance to thermal shocks.

Concerning the workability of the 'Niobium Crystals™', one can observe that there is an increase in the softening and vitreous transition temperatures, which implies a slight increase in the treatment temperature for stress relief. Despite the hardness measurement showing slightly higher numbers than commercial lead crystals, it was found that the 'Niobium Crystal™' glasses could be easily cut and engraved.

The chemical resistance of the samples was measured by weight loss after immersion in acid solution (pH 1) for up to 57 hours, and in a neutral solution (pH 7) for periods of up to 105 hours at 50°C (Figures 2 and 3).

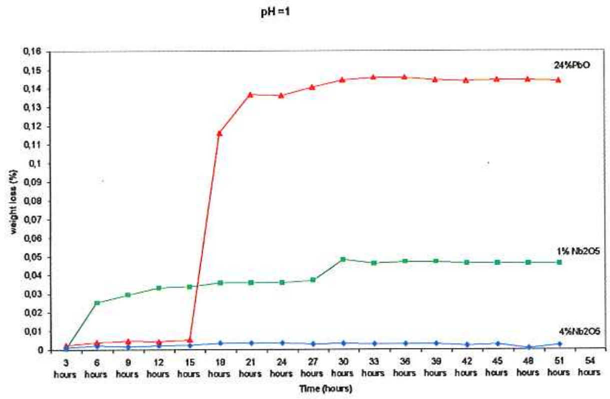


Figure 2: Weight loss in acid solution, pH 1 (weight loss % vs time in hours)

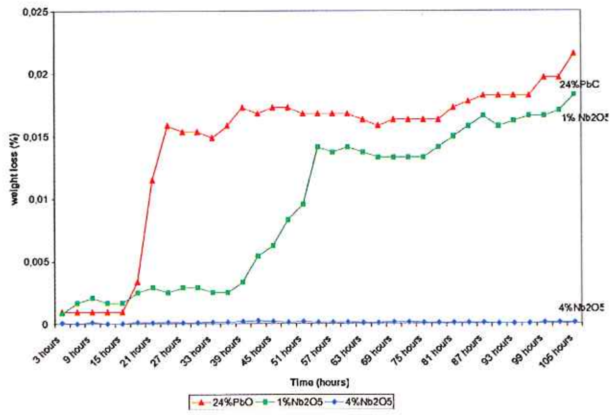


Figure 3: Weight loss in neutral solution, pH 7 (weight loss % vs time in hours)

It can be observed that the glasses with Nb_2O_5 underwent less chemical attack. In particular, the 4% Nb_2O_5 formulation showed excellent results, thus confirming niobium's role as a corrosion inhibitor.

Table 2 displays a comparison between the properties of commercially marketed lead crystals and those of 'Niobium Crystals™' in resisting attack by chemicals.

Material	Niobium Crystal™ $4\%Nb_2O_5$	Lead Crystal 1	Lead Crystal 2
Composition	$4\%Nb_2O_5$	24%PbO	24%PbO
ISO 695 classification mg/dm²	69	236	82.2
	A1-Low attack	A3-High attack	A2 - Slight attack
Weight loss - acids (WLA) (WLA) (mg/cm²)	-0.023	-0.06	-0.033
Weight loss - bases (WLB) (mg/cm²)	-0.3	-0.6	-0.42

Table2: Comparison between chemical resisting properties of commercial lead crystals and 'Niobium Crystals™'.

As can be noted in Table 2, the 'Niobium Crystals™' display an excellent performance, with low chemical attack according to the ISO 695 classification, whereas the lead crystals display slight to high attack. Comparing the WLA and WLB tests (see reference 2), which define the chemical durability of glass when in contact with acid (HCl 5% at 95°C) and base (NaOH 5% at 95°C), it may be concluded that the 'Niobium Crystals™' are more chemically resistant than the lead crystals.

Conclusion

The results obtained show that the 'Niobium Crystal™' is a viable and environmentally friendly alternative to commercially marketed lead crystals.

References

(1) L.M.Furtado, O.L.Alves 'Caracterização e Propriedades de vidros no sistema Nb_2O_5-K_2O-SiO_2-B_2O_3' (NKSB)
(2) U.S.Pat 5,270,269 Hares, George B.; Miller, Roger A.; Tietz, Lisa A., Corning Incorporated, 1992

MEMBER COMPANY NEWS

Angus & Ross

Angus & Ross announced in early June that its Brazilian subsidiary had completed an agreement on the development of 'highly-prospective gold/tantalum licences in the state of Mato Grosso, Brazil', totalling 600 hectares. Exploration in 1980-82 indicated a resource of about 'half a million pounds of tantalite' grading more than '500g/t tantalite', and more recent exploration indicated that the resource could represent only a small part of a much larger system. The company intended to start work at once on test pits and further investigation and development. Operations Director Richard Burt described the agreement as 'very significant to the company's overall strategy'.

In July Angus & Ross reported a programme of sampling of gold and tantalite in stream sediment in the Buchanans Creek tenements in Australia, a new area with potential for tantalite. The company was also developing relationships in China, and evaluating projects in tantalum.

AVX

For the March quarter 2004, AVX reported net sales of $315.8 million, bringing net sales for the fiscal year ended March 31st 2004 to $1136.6 million. President and CEO John Gilbertson stated that sales improved over the previous quarter, and 'exceeded the same quarter last year by 20%', which he attributed to the continuing improvement in the electronics industry. The net loss for the March quarter was $8.0 million, the loss was attributed to restructuring charges.

AVX Corporation reported on July 28th that net sales increased $88.3 million to $345.0 million in the quarter ended June 30th 2004 compared to the same quarter of 2003. Mr Gilbertson stated 'The continued expansion of our business has allowed AVX to grow and improve profitability during the recovery in the electronics markets'. Net income for the quarter was $22.9 million. Income from operations improved, reflecting a lower cost structure resulting from streamlining of operations, reduction of operating costs, enhanced production capabilities in low cost regions and lower material costs. Mr Gilbertson commented that restructuring had greatly improved the operating results and the financial position of AVX was 'exceptionally strong'.

AVX/Cabot

In June, Cabot announced that it had received a favourable ruling from the Massachusetts Superior Court upholding Cabot's long-term tantalum supply agreement with AVX. A separate Federal Court action filed by AVX against Cabot is still pending.

Throughout the litigation, AVX has continued to purchase tantalum from Cabot in accordance with the supply agreement between the two companies, and Cabot described AVX as 'a valued customer'.

Cabot Supermetals

In the annual report for 2003 the performance of the Supermetals part of Cabot Corporation was described as 'excellent... instrumental in helping us maintain our solid earnings', although it also 'struggled with the impact of global economic conditions'. The new product area of thin films was 'exciting', said the company.

For the quarter ended June 30th 2004, the Cabot Supermetals business 'earned $18 million of segment profit reflecting higher tantalum powder volume and lower operating costs, offset in part by unfavourable currency translation of foreign earnings', which was described as a 'strong performance', and represented an increase in segment profit of $4 million compared to the same period of 2003.

In March, Cabot announced the election of Carol Flack as Vice President and General Manager of Cabot Supermetals; she had joined Cabot's Corporate Planning group in December 2003. Her first degree was in chemical engineering.

In July Cabot announced an extension of its supply agreement with EPCOS to 2009.

Cabot Supermetals KK

Mr Y. Komatsu retired as President of Cabot Supermetals KK in April 2004, and is now an Advisor to the company. Mr Komatsu was the nominated delegate to the T.I.C., and Mr Jay Yamaguchi has been nominated to succeed him in this role, as he has been appointed as the new President of the company.

Cambior

For the second quarter of 2004, Cambior's sales of niobium were considerably higher than in the same quarter of 2003, 'due to increased demand from the global steel industry', commented the firm.

In July Cambior completed a merger transaction with Sequoia Minerals which meant that Cambior took over control of the operation of the mine as well as the marketing of the niobium products, formerly shared so that 50% of the production was Cambior's. The mine, in operation since 1976, has a milling capacity of 3500 tonnes per day and an expected life of at least 15 years. Its pyrochlore concentrate is transformed into ferroniobium grading 66% niobium using an aluminothermic converter. The consolidation of the Niobec operations in the hands of Cambior will allow for the implementation of a long term improvement programme

Chori/Advanced Material Japan

Chori has recently been renamed Advanced Material Japan, and the address is now 9-13, Akasaka 1-chome,Minato-ku,
Tokyo 107-0052, Japan.
Tel.: +81 3 3560 5181
Fax: +81 3 3560 5182
e-mail: hi-yoshinaga@amjc.co.jp

Mr Hiroaki Yoshinaga, Manager of Rare Metal Group, is the nominated delegate of this member company, taking over from Mr Shigeo Nakamura who was the delegate of Chori since it joined the T.I.C.

EPCOS

In the quarter ended March 31st EPCOS reported a 'seasonal decline' in sales of tantalum capacitors to the mobile phone industry, although sales to distributors increased.

A 'positive trend in business' was announced by EPCOS for the quarter ended June 30th 2004, although sales of tantalum capacitors were 'around the previous year's level'.

Sons of Gwalia

In its report on the quarter ended June 30th 2004, Sons of Gwalia stated that its Greenbushes mine had produced 355 407 lb Ta_2O_5 contained in concentrates, exceeding forecasts. Wodgina produced 311 091 lb Ta_2O_5 contained in concentrates. In the March quarter production was 245 012 lb Ta_2O_5 contained at Greenbushes and 283 061 Ta_2O_5 contained at Wodgina.

Long term contracts with H.C. Starck and with Cabot extended to December 2005, and negotiations for renewal of the contracts for 2006 to 2008 were under way, the report continued. A new contract with Starck had been agreed in principle, and negotiations with Cabot were continuing. The company had also entered into other short term contracts.

At the end of August, Sons of Gwalia announced the appointment of administrators, on a voluntary basis. The administrators are to take control of Sons of Gwalia's businesses, property and affairs with a view to reorganisation.

It is understood that tantalum production and supply are continuing, and in this respect business goes on as usual. The problems that have arisen are in relation to the reserves and resources of gold, and the associated gold hedging arrangements. The Australian Stock Exchange is investigating.

Hitachi AIC

Recent news on the Hitachi AIC web site featured a low profile tantalum electrolytic capacitor which would increase freedom in circuit design, as the 1mm high capacitor could be set near other low profile components or 'even underneath the other component'.

Kemet

Following the successful start-up of its first production facility in Suzhou, China, the ground-breaking of Kemet's second Suzhou facility was reported in June. Components produced here would enhance Kemet's market leadership in tantalum products, said the company.

For the quarter ended June 30th 2004, net sales were $122.4 million, compared with $117.1 million for the March quarter. Net income after special charges was a loss of $1.9 million for the June quarter, and a loss of $52.1 million for the March quarter. CEO Dr Jeffrey Graves stated that net sales for June increased 16% and total unit shipments increased 54% compared to the June 2003 quarter, 'reflecting the continuing improvement in the electronics industry'. By channel, 56% of total sales were to distribution customers, 23% to Electronics Manufacturing Services (EMS) customers, and 21% to Original Equipment Manufacturing (OEM) customers.

The strongest growth was in Asia and Europe, and Dr Graves expected that unit shipment growth would continue on the same lines, assuming that economic growth continued. Virtually all commodity production would be in low cost regions of the world by mid-2005, already 90% of the production workforce was in such regions, and this reorganisation would incur special charges.

In an interview reported by MarketEye, Dr Graves said that the determining factors moving forward that would influence the electronics industry remained the same as before: 'more functionality, faster speeds, longer life, smaller packages and lower cost'. 'Interconnectivity... would be an emerging trend and devices which could do this best would be successful'.

In August Kemet named Philip Lessner as Vice President, Tantalum Technology and Technical Marketing, and Conrado Hinojosa as Director of Tantalum Operations, with responsibilities including the supervision of all tantalum surface mount and leaded product manufacturing operations in the United States and Mexico, and the high volume production of low cost commodity products in Matamoros and Victoria.

Kemet/Cabot

Kemet announced on September 7th that it had entered into an extension of its long term tantalum supply agreement with Cabot Corporation to the end of calendar year 2009. Kemet CEO Dr Graves said that the extension would 'enhance the long term reliability of the tantalum supply chain'. For Cabot Supermetals, Carol Flack, Vice President and General Manager, said that the agreement provided Cabot with a significant supply relationship with a valued customer and ensured Kemet a reliable and high quality source of tantalum powder.

NEC Tokin

Mr Masashi Oi , General Manager of the Capacitor Division, has taken over as T.I.C. delegate from Mr Hideo Oka.
Contact details of the company are as follows:
Chiyoda First Building, 8-1, Nishi-kanda 3-chome,
Chiyoda-ku,Tokyo 101-8362, Japan.
Tel.: +81 3 3515 9265
Fax: +81 3 3515 9254

Reading Alloys

An article on the facilities and products of Reading Alloys was included in Bulletin 118. Refresh your memory or learn more about the company which will be the object of our field trip on October 12th by looking at the web site www.Reading-Alloys.com.

Seco Tools

Ms Elisabeth Ljunggren has succeeded Mr Bernt Westin as the nominated delegate of Seco Tools; Ms Ljunggren is the Purchasing Manager.

Tantalum Australia

In May, Tantalum Australia announced that it had 'signed an exclusive long term contract with an African mining and marketing company to take delivery of a minimum 330 000lb Ta_2O_5 per annum', to be upgraded at the company's mineral dressing plant at Balcatta.

The company also announced in the following months the establishment of two long term sales contracts with Chinese refiners.

Tertiary Minerals

Tertiary Minerals continues to work with a specialist merchant bank to secure further funding of its Ghurayyah project, although negotiations with a large Saudi company with which it had hoped to establish a joint venture have recently been ended.

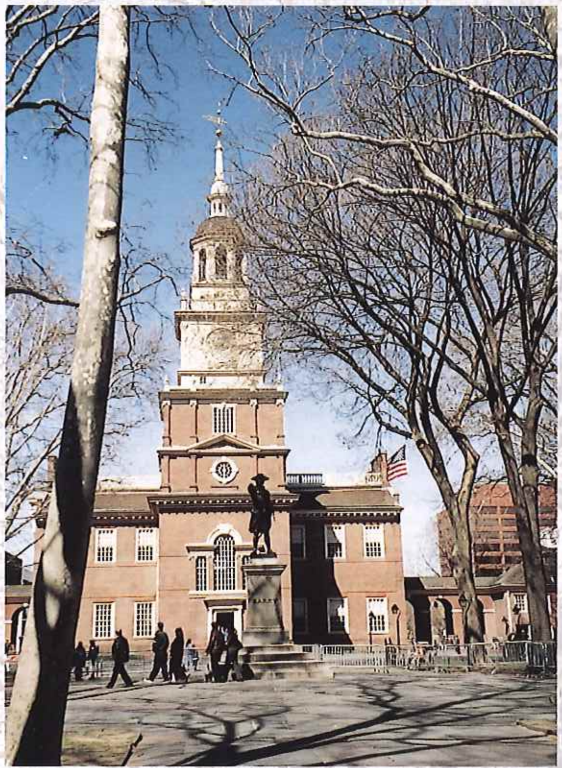
The company's exploration programme started 2004 'at a strong pace', said Executive Chairman Patrick Cheetham; Tertiary Minerals is 'well funded to meet budgeted exploration' for the balance of the year, and 'looking forward to reporting further progress on a regular basis', he added.

TVEL

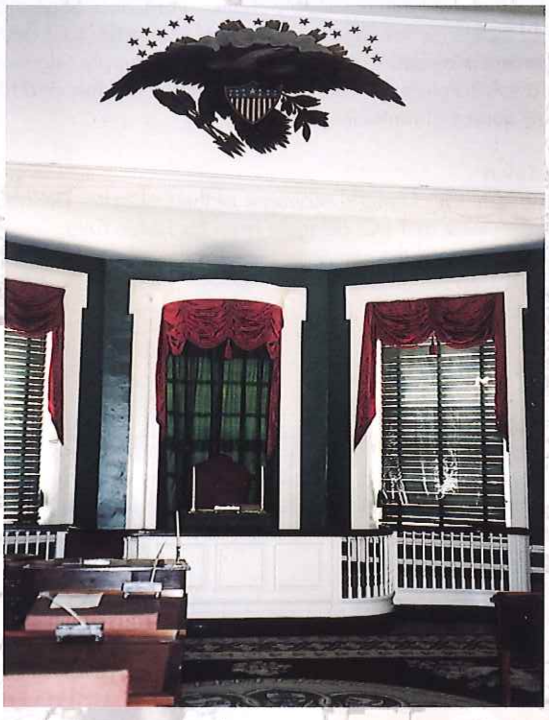
Mr Stanislav Golovinsky, Vice-president, has been nominated as the T.I.C. delegate of TVEL, succeeding Mr A. Badenkov.

HISTORIC PHILADELPHIA

Philadelphia played an important part in the early history of the United States, and was for a short time the capital of the new country. Independence Hall was the meeting place for those who signed the Declaration of Independence.



Independence Hall



The Senate room

The room in which the Declaration of Independence was signed

Photos: JW