Paragon Machine Works manufactures new line of titanium furniture

Mark Norstad, owner of Paragon Machine Works in Greenbrae, California, has started a new modern line of furniture using titanium. The titanium furniture includes a line of attractive yet comfortable titanium couches and chairs. Fabricated from titanium tubing, Paragon Machine Works chose titanium for its low modulus of elasticity, corrosion resistance, high fatigue strength-to-weight ratio, and natural good looks. Because of titanium's inherent flexibility and ability to maintain higher levels of stress without damage, each tube can move individually beneath a person creating a new level of comfort. The polished finishes of the tubes are also complimentary to any décor and will stay bright over years of hard use. The only maintenance needed is an occasional cleaning with soap and water. The frames are made of anodized aluminum with all fasteners made from stainless steel. This furniture is designed to work indoors or out.

The furniture can be custom made to fit a designated space and anodized in a variety of colors. Visit Mark during the ITA Conference in the Exhibition Hall to see the titanium couch on display. For more information call (415) 927-0348 or visit www.paragonmachineworks.com.

Inside this issue:
- What’s New in Titanium .................................................. 2
- Committees/Projects ...................................................... 6
- Within Titanium Industry Winners ................................. 8
- 2003 Titanium Achievement Award ............................... 9
- Titanium Publications .................................................... 10
- TITANIUM 2004 Request for Information ....................... 11
- Fundamentals of Titanium Workshops ......................... 12
- In Memorium ............................................................... 13
- Technical Discussion Forum ......................................... 14
- Classified Ad’s / Industry Calendar of Events ................. 15
- Current Membership ..................................................... 16
What’s New in Titanium?

Allegheny Technologies Introduces Versatile ATI 425 Titanium Alloy

PITTSBURGH, PA--8/18/03-- Allegheny Technologies Incorporated (NYSE:ATI) announces ATITM 425 titanium, an innovative new titanium product that is an alternative to the most common high-strength titanium alloy and an addition to ATI's wide range of high-strength titanium alloys. ATI 425 titanium offers strength comparable to Ti-6Al-4V; yet, unlike Ti-6Al-4V titanium, ATI 425 titanium is both hot and cold workable. As a result, ATI 425 titanium can be produced in a variety of forms, including sheet, coil, strip, Precision Rolled Strip® product, plate, seamless tube and pipe as well as cast and engineered products.

"ATI 425 titanium is the result of our new product development and Coordinated Business Development initiatives," said Jim Murdy, Allegheny Technologies' president and chief executive officer. "We recognized that the market needed a high-strength, lightweight material that provides certain advantages compared to existing specialty materials. Because ATI 425 titanium is both hot and cold workable, we can provide nearly all required product forms to a variety of end-use markets using ATI's extensive array of finishing capabilities."

One of the key strengths of ATI 425 titanium is that it is comparatively easy to produce and form due to its workability during the production and forming processes. Tests have shown that ATI 425 titanium can be fabricated more easily than Ti-6Al-4V. Duplex annealed ATI 425 titanium plate exhibited good fracture toughness; cold rolled and annealed ATI 425 titanium sheet has been bent to radii of 2.5 times its thickness. ATI 425 titanium is also heat treatable and can be solution-treated and aged to higher strength levels. Initial results indicate that the alloy is weldable and that annealed welds are ductile.

Allegheny Technologies plans further development of ATI 425 titanium products for a wide variety of uses. For further information or to discuss potential applications, please contact Mr. Larry Martin, business development manager, ATI Wah Chang, at 541-924-6896.

Allegheny Technologies Incorporated is one of the largest and most diversified specialty materials producers in the world, with revenues of approximately $1.9 billion in 2002. The Company has nearly 9,600 employees worldwide and its talented people use innovative technologies to offer growing global markets a wide range of specialty materials. High-value products include nickel-based and cobalt-based alloys and superalloys, titanium and titanium alloys, specialty steels, super stainless steel, exotic alloys, which include zirconium, hafnium and niobium, tungsten materials, and highly engineered strip and Precision Rolled Strip® products. In addition, we provide commodity specialty materials such as stainless steel sheet and plate, silicon and tool steels, and forgings and castings. The Allegheny Technologies website can be found at www.alleghenytechnologies.com.

Solar Atmosphere’s Large Vacuum Furnace Processing

Titanium thermal processing is a challenge, but the advent of large vacuum heat treating furnaces has enhanced both process and product. Pyrometry uniformity, along with very tight, leak proof vacuum furnaces are a necessity. Solar Atmospheres, with plants in Hermitage and Souderton PA, has developed and manufactured vacuum furnaces of varying lengths and sizes to effectively and efficiently degass and anneal titanium product.

Solar Atmospheres, as commercial heat treater, has invested heavily in large horizontal furnaces that are 6, 10, 12 and 24 feet long with a weight capacity up to 60,000 lbs. Solar processes titanium bars, ingots, sheet, coils and plate to improve the material’s metallurgical strength.

The newest vacuum furnace adds a new capability with an 84” width and 64” height making it possible to process extra wide and tall loads. This extra wide furnace has a 35” Varian diffusion pump to attain low vacuum levels of 1 x 10^-6 torr. The all-metal moly hot zone provides an ultra clean environment that is often needed for medical applications. Solar assures precise temperature processing with a minimum of 3 thermocouples (up to 24) that are placed in the material.
What’s New in Titanium—continued

Solar Atmospheres continued from page 2 - core to record temperatures at every stage of the furnace cycle.

Solar’s processing experience and large furnace capacity have enabled it to service the titanium industry for the past decade. It is the increasing demand for vacuum degassing, homogenization and annealing that has driven the investment in large furnaces. For more information please contact Bob Lacock at 800.347.3236 or email rdl@solaratm.com.

Vulcanium Opens East Coast Sales Office

Vulcanium Metals Incorporated (VMI), global distributor of titanium mill products, is proud to announce the opening of its East Coast Sales Office and the addition of James Spehrley as its East Coast Regional Manager. This new location compliments VMI’s Illinois and California warehouse and sales facilities.

Spehrley brings to his territory a decade of domestic and international experience in the titanium industry. He provides an immediate increased presence and on site accessibility to VMI’s medical, commercial/industrial and aerospace customers.

Spehrley’s specific knowledge of titanium processing is invaluable in understanding metal specifications. His first-hand experience following metal from ingot through the forming process makes him intimately familiar with all of titanium’s unique properties and how they can best be put to work. For more information, contact Spehrley by phone at 800-628-5884 or by email at jspehrley@Vulcanium.com or visit VMI on the web at www.Vulcanium.com.

Titanium Tubing

Gibson Tube Inc. North Branch New Jersey, has recently added titanium tubing to their portfolio of welded specialty tubing products. The Company, founded in 1962, has been a leading manufacturer of welded stainless, nickel alloy, and duplex alloy tubing. Primary markets serviced include, Oil & Gas, Power Generation, Chemical Processing, Food and Beverage, and General Instrumentation.

Initial titanium orders have been limited to Grade 2, O.D.’s ranging from .500” through 1.500” and wall thicknesses of .0200” through .083” up to 60 feet in length. With a unique capability of manufacturing tubing in coils exceeding 50,000 lineal feet, Gibson is currently exploring potential applications for coiled titanium tubing. As a recent member of ITA, Gibson Tube representatives look forward to answering any questions during the October Conference & Exhibition in Monterey California. For more information, contact Gibson Tube Inc. at: 908 218-1400 or visit their website at www.gibsontube.com.

Titanium & Ti Alloys from Ulbrich Stainless

Titanium and titanium alloy strip in foil gauges is available from Ulbrich Stainless Steels & Special Metals Inc. of North Haven, CT (booth 108, ITA show). These products, tailored to the needs of fabricators of unique products, are processed through Ulbrich’s rolling mills to gauges between .001 and .032 inch. Rolling provides uniform thickness throughout the coil and the appropriate properties for subsequent forming and welding. This is followed by precision slitting to widths as narrow as .030 inch.

For more information, contact Ulbrich Stainless Steels & Special Metals Inc. at 57 Dodge Avenue, North Haven, CT 06473 or telephone 800-243-1676. Visit their website at www.ulbrich.com.

Send Your Press Release

ITA Member companies — increase your companies exposure by submitting a press release for the ITA TITANIUM Newsletter. Submit your titanium articles to the ITA to appear in the next months issue of the newsletter. Articles should be e-mailed directly to sblicker@titanium.org.
AVISMA occupies the largest sector of the world titanium sponge market—up to 32%. The quality of Berezniki-produced sponge titanium is considered to be the best in the world. The Group is a holder of about 200 Quality Certificates issued by most of the world leading aerospace and engine building companies.

In the nineties VSMPO had been actively working on reconstruction and upgrading of its manufacturing facilities. The exported product mix has changed. Today the share of exported high added value products such as sheets, shapes, forgings, die forgings, billets and tubes has risen from 40% to 80%.

Cooperation of VSMPO with foreign aircraft building companies is characterized not only by the supply of products, but also by the development of new materials and technologies, including titanium alloys with enhanced strength and fatigue characteristics for landing gear components of modern aircraft produced by Boeing and Airbus. The VSMPO-produced disk quality material is soon expected to enter the international market of rotor grade material for aircraft engine applications.

In order to facilitate sales of commercial application titanium to international non-aerospace markets, in May 2003 VSMPO and the US-based Allegheny Technologies Inc. (ATI) announced the creation of UNITI joint venture. The JV shall be involved in production of a wide range of products: ingots, slabs, strip, plates, billets, bars, seamless and welded tubes, sheets, band and welded tubing of CP titanium.

According to the annual reports published by the world titanium companies, production rate and share of aircraft application products in the global volume of titanium shipments have notably decreased in 2002 versus 2001.

The VSMPO-AVISMA Group managed to avoid a drastic reduction in the volume of output. VSMPO’s sales volume in money terms increased last year by 6.8% versus previous year’s figures. Sales growth of VSMPO products occurred primarily due to the increase in demand for titanium products from the Russian consumers. Although the volume of titanium export shipments in 2002 decreased by 11%, domestic sales of titanium increased by 47%. Reduction in titanium mill product shipments to the USA aircraft market was compensated by a considerably high consumption of CP ingots and slabs by customers from Japan and South-East Asia.

Russian Titanium Group

VSMPO-AVISMA Group (including Verkhnaya Salda Metallurgical Production Association and Berezniki Titanium & Magnesium Works) created in 1998 is connected by a uniform process route beginning from sponge titanium production and up to the finished products of titanium alloys.

Today VSMPO is the world leading titanium manufacturer with the capabilities in place to produce all major types of metallurgical semi-products of titanium alloys.
Aside from the aircraft sector, revival of the Russian economy is now being observed in power industry. The range of VSMPO products is being expanded to meet increasing requirements from chemical, oil and gas industry, thermoelectric and nuclear power stations.

One of the most promising types of products for power engineering – thin-walled welded tubes of titanium alloys. VSMPO tubes with the wall thickness of 0.6-1 mm ensure high heat transfer intensity and stable performance characteristics during the entire service life.

The VSMPO-AVISMA Group has set itself the task of maintaining stable operation of their manufacturing facilities at the time of crisis in the global titanium market while preparing their manufacturing and technological potential for another rebound in demand for titanium products. Increasing requirements from the Russian consumers are making the Group highly responsible for the future of the domestic industry.

In order to meet these objectives, both VSMPO and AVISMA annually make considerable investments into reconstruction and development of their manufacturing base, aimed to enhance the quality and expand product mix, diversify and approve their products and processes to the international standards. In several years time the VSMPO-AVISMA Group’s production volume is expected to be increased up to $500 mil.

Committees/Projects within Titanium Industry:

ASTM Strength Study Progress
(MTI Project 151-02)

The ASTM Strength Study was undertaken to determine if reported properties of recently produced unalloyed titanium would support an increase in the specified minimum ultimate tensile strength (UTS) of ASTM unalloyed titanium Grades 2 and 3 with no change in the currently specified yield strength (YS) range, elongation, or industry production practice. Such an increase would have significant commercial implications because the Design Allowable Stress in the ASME Boiler Code is based on the minimum specified UTS at room temperature. This change could significantly reduce the cost of pressure equipment, piping, heat transfer equipment, and tanks and make solid titanium construction competitive with clad over a wider range of process conditions.

During the study, the Japan Technical Society suggested a decrease in the minimum yield strength of Grade 1 instead of an increase in UTS to address the commercial concern that most Grade 1 applications require high ductility and gain minimum value from higher strength. The database includes over 7,200 individual tensile tests covering Grades 1, 2, 3, and 4 and products ranging from 0.012” to 5” section thickness, from over 30 producers worldwide.

The current recommendations from the study will be presented to ASTM B10 at its November meeting. Contact MC Consulting at jimmcmaster@msn.com for more information, comments on the study or the current recommendations.

Grandis Metals Announces Name Change

In order to stress full commitment and dedication to titanium industry, Grandis Metals is announcing change of its name to GRANDIS TITANIUM. GRANDIS TITANIUM is a worldwide distributor of titanium materials - wire, rods and bars, sheets, plates, slabs and ingots, as well as titanium sponge and ferrotitanium. Since 1994 GRANDIS TITANIUM specializes in sales to and development of commercial applications of titanium: sport, automotive, consumer goods, medical, chemical, marine and other non-aerospace applications. Currently Grandis sells titanium in 31 countries on all continents. Grandis maintains warehouses in Los Angeles (USA), Rotterdam (Netherlands) and Moscow (Russia), and is in the process of opening warehouse in China. Worldwide sales are headed by Dr. Igor Krijenitski.

Grandis Titanium New Sales Office

Grandis Titanium is pleased to announce opening of new sales office in Harbin, China starting October 1, 2003. Office will be headed by Mr. Zhang Xingping. Mr. Zhang has BA in International Business from Harbin University and MA in Law from HeiLongJiang University. Mr. Zhang will bring his extensive knowledge of growing Chinese titanium industry and experience working in difficult markets. Grandis Titanium currently ships to China approximately 400,000lbs of titanium products on annual basis and expects significantly increase it’s sales in China with opening of a sales office. For more information visit their website at www.grandis.com.
### Committees/Projects within Titanium Industry

#### Safety Committee
**Wednesday, October 15, 2003**
**9:00 am - 12:00 pm in the Cottonwood I Room**

The ITA Safety Committee is an excellent forum for sharing information and learning from each other’s experiences in an industry where safety risks can be relatively high. In a highly competitive industry, safety is one of the few areas where competitive pressures do not and should not inhibit honest and open communication between participants.

The agenda will include the following:
- Welcome and Comments
- “29 Furnace Incident Without Injury” L. Arent, RMI Titanium Company
- “Revision of Water-Cooled Copper Crucible & Hearth Section of Proposed Safety Manual” R. Strohecker, Strohecker Inc.

Discussion and review of status on Safety Manual

Schedule of 2004 Safety Meeting location and date

Conclusion of Meeting

The safety meeting is open to all participants at the TITANIUM 2003—19th Annual Conference and Exhibition.

#### Applications Committee
**Wednesday, October 15, 2003**
**9:00 am - 10:30 am in the Cottonwood II Room**

ITA invites all Members to attend a brief 2004 Outlook meeting where the following items will be reviewed:

#### 2004 Trade Shows:
- NACE expo Corrosion - New Orleans, Mar. 28 - Apr. 1
- TIMATAC Titanium Exhibition - Brescia, Italy, Apr 21-24
- MD&M—New York, June 15-17

#### Publications Review:
- Expansion of Specifications Book
- Revision to Medical, CPI & Marine Data Sheets
- How to Weld Video
- Inclusion of world titanium statistics for CIS, China in Statistical Review

#### Buyers Guide:
- Develop a sub-committee to review current categories and recommend additions and changes.

#### On Line Technical Library:
- Introduction to new area of ITA web site commencing Spring, 2004

#### American Welding Society

The American Welding Society (AWS) has four subcommittees working on Titanium Welding. They include the A5K Subcommittee on Titanium and Zirconium Filler Metals, AWS A5.16 Specification for Titanium and Titanium-Alloy and D1N Subcommittee on Titanium Welding, D10K Subcommittee on Welding of Titanium Piping, and G2D Subcommittee on Reactive Alloys.

The Welding Electrodes and Rods will have a new revision out in the next three months. AWS is moving toward individual marking of wire (straight lengths) for all materials. The titanium specification does not require this at the present time but requires that each package be marked.

Any questions concerning these or other subcommittees Please contact: Edward Mitchell, 800-443-9353 ext 254 or email mitchell@aws.org.

#### 2004 TMS Annual Meeting & Exhibition

The 133rd Annual Meeting & Exhibition of The Minerals, Metals & Materials Society (TMS) will occur during the week of March 14-18, 2004. Join more than 3,500 science and engineering professionals, representing more than 60 different countries, who will come together for the opportunity to add to their own knowledge by capitalizing on the expertise and experience of their colleagues. More than 200 sessions and 1,500 individual presentations are scheduled. Whether your technical interests lie in precious metal extraction, aluminum processing, high-temperature superconductors, or just about any other materials field or metallurgical discipline.

In addition to the technical programming highlights, take advantage of special lectures, tutorial presentations, and short courses. The meeting will also feature Expo 2004, which will provide you an opportunity for one-to-one information and hands-on examination of products and services that answer the needs of your organization. At least 160 exhibiting companies are expected to fill the exhibit.
Committees/Projects within Titanium Industry

ISO/TC79/SC11 Meeting
Wednesday, October 15, 2003
Redwood Room from 9:00 to 1:00 pm

Following the ITA, 19th Annual Conference & Exhibition, the ISO/TC79/SC11 (Titanium) Meeting will be sponsored by the Japan Titanium Society.

The following article is written by Dr. Toshiyuki Suzuki - The ISO/TC79/SC11 is a new subcommittee for titanium established last year (ref. Technical Management B resolution 4/2002: Establishment of a subcommittee in ISO/TC79 that The Technical Management Board ratifies the decision of ISO/TC light metals and their alloys to establish SC11 Titanium and notes that the secretariat will be allocated to JISC (Japan).

The subcommittee, with Dr. Toshiyuki Suzuki as chairman and Mr. Shun-ichiro Akiyama as secretary is now composed of 10 P (participating) member countries, China (SAC), France (AFNOR), Germany (DIN), Italy (UNI), Japan (JISC), Korea (KATS), Russia (GOST), Spain (AENOR), Sweden (SIS) and Switzerland (SNV) and two O (observer) member countries, Egypt (EOS) and Finland (ISFS).

The first meeting was held in May this year in Oslo and this will be the second meeting. Resolutions of the first meeting are: 1. Scope to standardize titanium alloys for non-aerospace applications, 2: Establish five working groups, 2-1. Terms & Definitions (Germany), 2-2 Chemical Analysis (Russia), 2-3 Non-destructive Inspection (Japan), 2-4 Designation System (France) and 2-5 Materials Specifications (USA) and 3: The next meeting to be held on October 15, 2003, Monterey, California.

Basic Philosophy: It is due to the reason that the major titanium market has been traditionally focused on the specific fields of military and aerospace in the United States, Europe and CIS and nobody has never claimed its necessity.

However, in the recent years, the market has expanded over much broader industrial and civil fields other than military and aerospace, such as chemical industries, architecture, heat exchangers, power generation plants, automotives, sporting goods, consumers’ goods, etc., consequently, necessity of standardization of titanium is growing globally.

In the meantime, development of new titanium markets for non-aerospace fields has been a very important long-term goal, not only for the Japanese industry, but also for the other countries which are involved in the titanium production. Given the fact that the effects of 9/11 and other recessionary trends are continuing to play a very important factor in the aerospace industry, it must be a common understanding for everybody who is facing the current serious recession of the industry, that to some very important part, our long term world industry production stability lies in the further development of non-aerospace markets worldwide.

It may not be so important to further develop the non-aerospace applications as long as we continue to mostly focus in the aerospace market only. But, if we are to try to penetrate titanium into much wider, more diversified fields of the market, it is absolutely necessary that every citizen of the world is aware of titanium. For that purpose, it becomes indispensable to establish commonly recognized world standards, which could be familiar to and well acknowledged by all citizens of the world.

ASTM standards to date have been generally referred to for titanium, however, we believe that the preparation of ISO standards to better suit the non-aerospace applications, i.e. industrial and consumer goods, is important, necessary and a long term solution. Work will continue in the ASTM standards for the near term, and it may some time but ISO standards in the end will be written for titanium.

Growth of the market should benefit all the people involved in the titanium industry and we have a very significant role in helping to forge the long-term direction and purpose to the world titanium industry and world titanium producers.

Under the hard economic situation, we should try to think of the most cost/time saving method for procedure of preparing the ISO standards by making the best use of internet and minimize the number of the conventional meetings usually held in the ISO down to once a year or every two years only. Nevertheless, we have to acknowledge that it will take us some years to prepare the principal standards such as chemical analysis, non-destructive inspection, materials specifications of major product forms, etc.

The next meeting will be held Wednesday, October 15th at 9:00 a.m. in the Redwood II Room at the DoubleTree Hotel. Anyone interested in participating or learning more about the committee is invited as an observer with prior registration to the JTS exhibit booth by October 13th.
## 2003 Titanium Achievement Award Winners

The International Titanium Association (ITA) has selected Dr. James C. Williams and Mr. John V. Andrews to receive the Titanium Achievement Award. The Titanium Achievement Award will be presented at the TITANIUM 2003 – 19th Annual Conference and Exhibition on October 14, 2003 at the ITA Annual Luncheon. Mr. Andrews will receive the award for the development & commercialization of the plasma cold hearth furnace for melting titanium alloys for critical rotating components in turbine engines. Dr. Williams will receive the award for furthering the metallurgical knowledge and the applications of titanium through significant research in titanium alloys.

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<th>Mr. John V. Andrews</th>
<th>Dr. James C. Williams</th>
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<td>Mr. Andrews served as President of the High Performance Metals Group of Allegheny Technologies Incorporated (ATI) from 1999 until his retirement in April 2000. He had been President of Allvac from 1971 to 1999.</td>
<td>Dr. Williams is the Dean of Engineering and Honda Professor of Materials at The Ohio State University. Up until March 1999 he was General Manager, Materials and Process Engineering Department, GE Aircraft Engines. He is a member of the National Academy of Engineering, a Fellow of TMS/AIME and a Fellow of ASM International. He is the recipient of the 1992 ASM Gold Medal, the 1993 TMS/AIME Leadership Award and the 2002 TMS/AIME Application to Practice Award. He was Chairman of the National Materials Advisory Board from 1989 - 1995. He is a member of The Oversight Committee of the Division of Engineering and Physical Sciences of the National Research Council, The Materials Science and Technology Division Visiting Committee at Los Alamos National Laboratory, The Engineering Division Advisory Board at Oak Ridge National Laboratory and the Technology Advisory Board for the Carnegie Institute of Technology, Carnegie Mellon University. He was a member of The Air Force Scientific Advisory Board from 1994 - 2000. Prior to joining GE in 1988 he spent 13 years at Carnegie Mellon University as Professor (‘75-‘80), President of Mellon Institute (‘80-‘83) and Dean of Engineering (‘83-‘88). Before joining Carnegie Mellon he held research and engineering positions with Rockwell (1968-1975) and Boeing (1961-1968). He has consulted extensively for government and industry. He has published over 200 papers based on his research. His professional interests include structure-property relations of high strength materials, the performance of materials in extreme environments (temperature, stress and strain rate), materials processing, technology policy, particularly as it pertains to materials and the management of high technology organizations. In much of his work he has specialized in titanium alloys. He and Prof. Lütjering have just completed a new book entitled “Titanium&quot;, published by Springer-Verlag.</td>
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<td>The High Performance Metals Group consisted of Oremet-Wah Chang, Allvac, and Allvac Ltd. The group produced a variety of specialty metals including titanium and titanium alloys, nickel-based alloys and superalloys, specialty steel alloys, zirconium alloys, hafnium, niobium, and tantalum. The group’s products served diverse markets including commercial and military aerospace, chemical processing, oil and gas, power generation, biomedical, and transportation. In 1960 Mr. Andrews joined Allvac and was instrumental in the growth and success of the company holding positions in sales, operations, and management. He also served as Southeast Group Executive for Teledyne, Inc., from 1976-93 and as a Group Executive for ATI from 1993-99.</td>
<td>Dr. Williams received his B.S., M.S. and Ph.D. degrees, in Metallurgical Engineering, from the University of Washington, the latter in 1968. He is married and has two grown children and four grandchildren.</td>
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<td>Graduated from North Carolina State University in 1955 with a BS degree specializing in Industrial Engineering. Prior to joining Allvac, Mr. Andrews served 2 years in the U.S. Army Ordnance Corps and was involved in production, planning, and quality control at R. H. Boulingy in Charlotte, NC. A 30-year member of ASM, Mr. Andrews is a member of the Carolinas Southern Piedmont Chapter. He was elected President of ASM International in 1994 and recognized an ASM Fellow in 1990. He has also served on various committees and as an ASM Trustee from 1988 to 1992. He became an ASM Honorary Member in 2000. He was a member of the Forging Industry Association and the Specialty Steel Industry of North America and served on the Board of Directors for the ITA. He has served on the Board of Directors for a number of organizations in North Carolina (NC), i.e., NC Citizens for Business and Industry, the Employers Association of the Carolinas, Foundation for the Carolinas, and U.S. Department of Commerce/North Carolina Export Council. He currently serves on the Board of Directors for Branch Banking &amp; Trust Company and Power House Mechanical Repair. He has served on the Board of Directors and as Vice-Chairman of United Way of Central Carolinas and President of Union County Chamber of Commerce and Rotary Club. He has also served on the Board of Advisors for the University of North Carolina and Johnson C. Smith University. In 1984 he was named Union County (NC) Executive of the Year.</td>
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Two new Titanium publications have entered the market, *Titanium* by Lütjering, G., *Technische Universität Hamburg-Harburg, Germany*; Williams, J. C., *The Ohio State Universite*, Columbus, OH, USA and *Titanium and Titanium Alloys: Fundamentals and Applications* by: Christoph Leyens and Manfred Peters. Both publications are available for viewing at the ITA Registration desk at the TITANIUM 2003—19th Annual Conference and Exhibition in Monterey. Publications are also available on the ITA website under the publication at www.titanium.org.

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**Titanium**

By: Lütjering, G., *Technische Universität Hamburg-Harburg, Germany*; Williams, J. C., *The Ohio State University*, Columbus, OH, USA

This comprehensive summary of the current state of the art of titanium addresses, in varying levels of detail, all aspects of titanium, including: basic characteristics and physical metallurgy, the extractive metallurgy, the various production processes, the correlations between processing, microstructure and properties, and all aspects of applications including economic ones. The book covers commercial pure (CP) titanium, alpha + beta and beta alloys, as well as titanium based intermetallics and titanium matrix composites. Richly illustrated with more than 300 figures, this compendium takes a conceptual approach to the physical metallurgy and applications of titanium, making it suitable as a reference and tutorial for materials scientists and engineers.

**Contents:**

- Introduction.
- Fundamental Aspects
- Technological Aspects
- Commercially Pure (CP) Titanium and Alpha Alloys
  - Alpha + Beta Alloys
  - High Temperature Alloys
- Beta Alloys
- Titanium Based Intermetallics
- Titanium Matrix Composites
- Special Properties and Applications of Titanium
- Series: Engineering Materials and Processes

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**Titanium and Titanium Alloys: Fundamentals and Applications**

By: Christoph Leyens (Editor), Manfred Peters (Editor)

An excellent reference for materials scientists and engineers needing to gain further knowledge of these engineering materials. After introductory chapters on the fundamental material properties of titanium, readers will find comprehensive descriptions of the development, processing and properties of modern titanium alloys. There then follows a detailed discussion of the applications of titanium and its alloys in aerospace, medicine, energy and automotive technology.

The well-balanced mixture of authors from industry and academia makes this handbook especially useful as a hands-on reference in all fields of modern titanium research and technology.

**Contents:**

- Titanium And Titanium Alloys: Structure, Texture, Properties
- Gamma-TiAl Alloys: Alloy Development & Properties
- Beta-Titanium Alloys
- Fatigue Of Titanium Alloys
- Oxidation And Oxidation Protection Of Ti Alloys & TiAl's
- Processing Of Titanium
- Reinforced Titanium Matrix Composites
- Titanium Alloys For Aerospace Applications
- Titanium Alloys For Medical Applications
- Titanium Alloys For Automotive Applications
- Titanium Alloys For The Off-Shore Industry

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Both publications are available for viewing at the ITA Registration desk at the TITANIUM 2003 in Monterey or purchase from the publication section of the ITA website at www.titanium.org.
TITANIUM 2004

20th Annual Conference & Exhibition
Call For Papers

ITA invites authors to submit a 200 word or one-page abstract of a topic of interest to a broad audience in your area of expertise related to the titanium industry. ITA will focus specifically on the technical themes provided by our members. We encourage you to contribute as well as contact your colleagues who will have something special to offer to this event.

The ITA Speaker Committee will review all submitted abstracts carefully. Relevance, timeliness, and quality are the key factors in the reviewing process.

Speakers are required to register for the conference and pay the appropriate fee before May 15, 2004. Authors wishing to present further papers will have an additional administration fee of $100 per paper. Please include the estimated length of time required for your presentation.

TITANIUM 2004
20th Annual Conference & Exhibition
Sheraton New Orleans
October 3-5, 2004

The ITA Conference and Exhibition offers a wealth of opportunities for your organization and professional growth! The entire conference – from exhibits to in-depth panel sessions – has been organized to build upon each other in a continuum of learning. This is an extraordinary opportunity to learn, exchange information with peers, and enhance your professional network. Best of all you will come away with the latest and most current information regarding titanium and the opportunities within the industry!

Attention Potential Exhibitors
2004 ITA Conference Floor Plan

The Association will open the 2004 Exhibition Floor Plan at the October Conference. You are cordially invited to attend the Conference & Exhibition where you can have the first chance to select your choice from over 40+ booths. Interested exhibitors can register for their 2004 booth space at the registration desk.

Exhibiting at the 20th Titanium Conference and Exhibition is a cost-effective opportunity to reach all aspects of the titanium industry as well as obtain free publicity in ITA printed publications and on the internet and network with industries important decision makers.

2004 Floor Plan
Selection Process Available at the 19th Annual Conference & Exhibition

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Enhance
TITANIUM 2004 Request for Information

The Conference and Exhibition Audience Includes...

The ITA Annual Conference and Exhibition is created for individuals who are involved or interested in titanium.

Titanium Professionals Including: Executive Staff, Sales & Marketing, Product Development Staff, Operations, Purchasing or Quality Control Managers, Suppliers to the Titanium Industry, Potential Users of Titanium, and Professors or other Academic Instructors.

Sightseeing Opportunities Include:

While in New Orleans don’t forget to take the time to explore New Orleans by participating in the 10th Annual Golf Classic or the sightseeing tour opportunities.

The 10th Annual Golf Classic will be held at the Oak Harbor Golf Club right outside of New Orleans. This 18 hole championship layout worthy of its critical acclaim, rated Four Stars by "Golf Digest Places to Play." Since its opening in 1992, Oak Harbor has quickly earned a reputation for excellence in course conditioning and dedication to personal service. Come see why Oak Harbor is the most talked about layout in the Deep South!

The Association will also provide two tours including the City Tour with Airboat Swamp Tour and a special Louisiana style cooking demonstration called “The Art of Creole Cuisine Cooking Demonstration & Lunch." Details are available on the ITA website at www.titanium.org.

Sheraton New Orleans

You can even make your reservations for the TITANIUM 2004—20th Annual Conference & Exhibition by calling the Sheraton New Orleans at (504) 525-2500. Remember to request the International Titanium Association room block rate of $189 for a single or double.

Have you reserved your booth space for TITANIUM 2004 in New Orleans October 3-5, 2004? Are you interested in presenting a paper at the next General Session? Visit the ITA Tabletop display in the Exhibition Hall for an updated floor plan or complete the following information and fax it to the ITA at 303-404-9111 and an ITA Representative will contact you shortly.

We look forward to seeing you in New Orleans to celebrate the 20th Anniversary of the International Titanium Association!

Exhibition Space Opportunities:
[ ] Please contact me regarding booth space.
  My booth preference is:
  _______ . _______ . _______.

Sponsorship Opportunities:
[ ] Please contact me regarding sponsorship opportunities.

General Session Opportunities:
[ ] I am interested in Moderating a Panel for the General Session.
[ ] I am interested in presenting a Paper for the General Session.

Please check mark which speaking panel(s) you are interested in
[ ] Commercial Aerospace
[ ] Military Applications
[ ] Welding Panel
[ ] Non Aerospace / Industrial
[ ] Emerging Technologies
[ ] Emerging Markets
[ ] Special Purpose Alloys
[ ] Corrosion / Marine Applications
[ ] Chemical Processing /
[ ] Other _______________________

Name:________________________________________
Title: ________________________________________
Company:_____________________________________
Address: ______________________________________
City, State, Zip: ________________________________
E-Mail:______________________________________
Phone: _______________________________________
Fax this form to (303)404-9111.
Fundamentals of Titanium Workshop

Why You Should Attend:
*Fundamentals of Titanium* will prepare you to present and work effectively with job-related functions that involve titanium. You will receive a complete overview of titanium and a thorough grounding in its metallurgy, characteristics, properties and uses.

As part of the course, ITA will provide attendees with comprehensive handouts to serve as reference tools to utilize the information as needed in the workplace. Attendees will also receive a 20% discounted voucher for the publication, *Titanium - A Technical Guide*, when ordered through the ITA. The registration fees include: workshop materials, entrance to the Titanium workshop.

Course Objective:
This comprehensive workshop will provide attendees with detailed information on the types, uses, and properties of common titanium alloys. Attendees will leave with an understanding of applied titanium metallurgy fundamentals.

Fees: *The cost for the course is $195.*

Workshop information can also be located on the “Seminars” section of the ITA website at [www.titanium.org](http://www.titanium.org).

Dates & Locations:
Courses available on the following dates and locations:

**Wednesday, October 15, 2003**
*Location: DoubleTree Hotel*
Two Portola Plaza
Monterey, California
(workshop immediately follows annual ITA conference)

**Wednesday, November 5, 2003**
*Location: Hilton Houston Hobby Airport*
8181 Airport Boulevard, Houston, Texas
(includes tour of RTI Extrusion Plant)

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REGISTRATION FORM - Register Now to Reserve Your Place!

Please complete this form and return with payment to:
International Titanium Association, 350 Interlocken Blvd., Suite 390, Broomfield, CO 80021
or fax this form, with credit-card payment to (303) 404-9111. For more information call (303) 404-2221.

_____ YES! Register me for The Fundamentals of Titanium

_____October 15, 2003 Monterey, California

_____November 5, 2003 Houston, Texas

Name: _______________________________________________________Title: ___________________________

Company: ______________________________________________________________________________________

Address: ______________________________________________________________________________________

City, State, Zip: _________________________________________________________________________________

E-Mail: __________________________________________Phone: ______________________

The registration fee is $195.00 per person.

Charge the registration fee to my Visa / Mastercard. ____VISA ____MASTERCARD (Please select one)

Name as it appears on Card______________________________________________________________

Card Number: __ __ __ __ / __ __ __ __ / __ __ __ __ / __ __ __ __ Exp. Date: ___/___

Authorized Signature: _________________________________________________________________

(One person per form, make photocopies as necessary.) Seats are limited.
In Memorium

Larry Cornelius,  
Vice President of Coastcast Corporation  
1941 – 2003

Larry Cornelius served in the US Navy from 1960 - 1970 (and an additional 16 years in the Navy reserve) primarily as a Meteorologist. His work in Meteorology carried over to a brief stint as a T.V. weatherman in the early 1970’s.

Larry started his work with Investment Castings at PCC (Portland Oregon) in 1977 (thru 1990). Larry was instrumental in developing and managing a facility for the manufacturing of preformed ceramic cores for Titanium and steel castings. In 1982, Larry also participated in the start-up of the Titanium casting facility. His work included developing and controlling shell systems from face-coat to backup for Titanium.

As the Engineering Manager at Schlosser Castings (now PCC-Schlosser) in Redmond Oregon from 1990-1992, and as the Process Engineering Manager at Tiline Corp (now Pacific Cast Technologies) in Albany Oregon from 1992 – 1995, Larry continued to be a leader in the development of Titanium shell systems and implementation of SPC.

From 1995 thru 2002, Larry was the Vice President and General Manager of the Titanium Operations at Coastcast in Gardena Ca. The primary titanium products were golf club heads and castings for use in commercial and automotive applications. Larry helped co-designed shell room equipment and arc melting casting furnaces that produced 3,000,000 components in one year!

Larry retired in 2002. He split his time at his summer home in Loreto Mexico with his lovely wife Jan where they enjoyed fishing and travel and in Oregon with his daughters, Brice and Jan Marie and his 5 grandchildren. Raised by a well-respected preacher (his father) Larry was an excellent father, a great husband, a true friend, a scholar, and a gentleman. His family and friends miss a truly outstanding individual.

Pete Rossin, Founder of Dynamet Incorporated

Mr. Pete Rossin, the founder of Dynamet, a valued Board member and Carpenter's largest single stockholder, died Sunday, Aug. 10, in Pittsburgh. Pete was 79.

Pete had founded Dynamet in 1967 and, when Carpenter acquired this titanium bar and wire converter in 1997, was serving as chairman and CEO. Pete had a long history in the metals industry, having held various production and operations positions at Crucible Steel, Fansteel Metallurgical, and Cyclops. He was a successful entrepreneur and known in the Pittsburgh area for his support of community organizations.

Pete held a bachelor's degree in metallurgy from Lehigh and a master's in metallurgy from Yale. He received the ASM Medal for the Advancement of Research, as well as a number of awards for his business success.

Pete is survived by his wife, Ada; a son, Peter Jr., and a daughter, Joan.

Professor Harvey Flower, Materials Scientist,  
Department of Materials, Imperial College London

Harvey Flower, Professor of Materials Science at Imperial College London, will be most remembered for his work on aerospace aluminum and titanium alloys. His work on the evolution of microstructure in alloy systems and its effect on the resultant properties was highly influential within the international scientific community.

Harvey was brought up in Beckenham and educated at St Dunstan's School, Catford, where he excelled in chemistry. He went up to Christ's College, Cambridge, in 1964 to read natural sciences and graduated with first-class honors. Attracted by the new "million-volt electron microscope", he moved to Imperial and completed his doctorate in 1970. He was appointed immediately to the academic staff.

Among his numerous achievements was the observation and explanation of a new structure (or "phase") in some titanium alloys, and the development of new high-strength, high-toughness alloys for aerospace applications. Flower made significant contributions to other fields of metallurgy. After the 1974 explosion at the Nypro chemical works in Flixborough, Lincolnshire, for example, he discovered zinc may embrittle stainless steel; this led to new regulations restricting the use of galvanized wire for holding insulation on to stainless steel pipework.

In 1988 his scientific achievements were recognized with the award of the Rosenhain Medal and Prize by the Institute of Metals. He was awarded the Armstrong Medal and Prize at Imperial College in 1974 for research on the physical metallurgy of titanium alloys and in 2001 he was awarded the Cooke Ablett award by the Institute of Materials for a research paper on the electron microscopy of steels. He served Imperial College with distinction, as deputy head of department and director of research in the materials department.

Flower's intellect extended well beyond scientific horizons, fuelled by his taste in literature and interest in history. He was an enthusiast of Wagner operas, and of aircraft, especially the Spitfire; the sight of Spitfires over Biggin Hill profoundly influenced a young Harvey toward his future career.
The Technical Discussion Forum is an excellent opportunity to educate the general public on titanium. This Forum allows individuals to post questions or seek advice on applications involved with titanium. ITA relies on membership to actively participate in assisting with technical questions.

Recent Inquiries - Do you have a comment?

Medical Applications: Medical Grade Titanium
Is there a difference between aircraft grade and medical grade 6Al-4V titanium? Would it be acceptable to use aircraft grade material for a non-implant short time contact medical application (contact of < 1 hour with internal body fluids). I have no previous experience in these issues and any help would be appreciated.

Processing Titanium: Chemical
I'd like to know a standard titration method used to determine levels of dissolved Titanium (grade 5) in a chemicals milling bath (HNO3+HF).

Titanium Grade 2: Grade-2 Magnetic Susceptibility
I am interested in the magnetic susceptibility of Grade-2 Ti, but I haven't been able to find any data for this particular alloy. (room temp. info is fine).

Post questions include:

Corrosion: Titanium Condenser Tubing
I am trying to find out how long titanium tubing has been used in heat exchangers; and types of failure mechanisms experienced.

Brazing: Soft Soldering to Titanium
Is it possible to join brass to Titanium using any form of soft solder?

Welding: Trailing Shield
I would like to know which points has to be taken into account for the designing and constructing of trailing shield for titanium welding.

Welcome to the ITA Technical Discussion Forum
Does anyone knows where to find a good Fatigue Curve for Commercially pure titanium, I looked in different places, but I can't find what I need. I need to find an SN curve for Ti sheet, Kt=3. Does anyone has any leads?

ITA Members may also view other postings on the Members Only website. Simply type in your password and access weekly questions received by the Association. If you do not have a password please contact Stacey Blicker at sblicker@titanium.org.

Upcoming Conferences & Exhibitions:

October 2003
12-15 2003 International Titanium Association 19th Annual Conference and Exhibition, Monterey, CA USA
15 Fundamentals of Titanium Workshop follows ITA 2003 Conference and Exhibition
26-28 Ryan’s Notes Ferroalloys Conference Phoenix, AZ
27-29 Society of Automotive Engineers, International Body Engineering Conference & Exhibition, Chiba, Japan

November 2003
5 Fundamentals of Titanium Workshop, Hilton Houston Hobby Airport, Houston, TX

Classified Ads

The Classified’s section of the ITA Web Site is located at www.titanium.org. When you submit a classified ad, ITA will proof your advertisement, process your payment, and post it to the website within 3 business days.

Complimentary Publication:

Free Guide to Weld Purging
Name of Your Company: Huntingdon Fusion Techniques Ltd
Contact Email: www.huntingdonfusion.com
Description: A free guide to Weld Purging is offered by Huntingdon Fusion Techniques Limited. The Company has specialised in Weld Purging Technology since 1975 and has developed a number of weld purging accessories which are used internationally in Industries fabricating with Titanium.

ITA Members may also view other postings on the Members Only website. Simply type in your password and access weekly questions received by the Association. If you do not have a password please contact Stacey Blicker at sblicker@titanium.org.
### Classified Ads

Companies welding titanium materials will benefit from having a copy of the guide available. This 20 page A5 booklet is presented as a glossary of weld purge terms and information from A to Z. Apply to the Company by email for an electronic copy and for hard copies to be mailed, state the number of copies and the current postal address.

#### Business Opportunity:

**Experienced Sales Engineer**  
**Contact Email:** jobopenings@vulcanium.com  
**Description:** Vulcanium, leading titanium equipment manufacturer, seeks experienced sales engineer. BA in chemistry, engineering, other tech field or equal experience; 5 years related sales; mechanical aptitude. Light travel. Metal finishing industry experience a plus. We offer team environment, competitive salary, bonus, medical, 401K. Fax resumes to 847-498-3392 or jobopenings@vulcanium.com.

**Metallurgical - Manufacturing Engineer**  
**Contact Name:** Miles A. Abkowitz  
**Contact Email:** maabkowitz@dynamettechnology.com  
**Description:** Challenging position for a metallurgist, materials engineer or mechanical engineer with experience in powder metallurgy and/or titanium materials, processes and applications. Candidate must be technically versatile, combining hands on mechanical capability with strong writing ability and excellent customer contact skills. Dynamet Technology, Inc., a small innovative Burlington, MA company needs to expand its team where each member contributes in a variety of functions. The company has pioneered the field of advanced powder metal manufacturing technology as applied to titanium alloys and titanium matrix composites in industrial, aerospace, military, medical and automotive applications. Education and experience in powder metallurgy, isostatic pressing, titanium technology and applications, quality control, tooling development and production scale-up are all helpful. Engineering degree required. To be responsive, candidate must provide a cover letter stating qualifications for this position, a resume and salary requirements.

**UK agent seeking additional lines.**  
**Contact Name:** David R Green  
**Contact Email:** david.green2@virgin.net  
**Description:** UK agent with B.Eng degree, 30 years metal sales experience and well established contacts in aerospace, power generation and offshore markets. Looking for additional products such as castings, forgings or other titanium products.

#### Materials Wanted:

**Looking to buy Titanium Usables.**  
**Name of Your Company:** North American Alloys  
**Contact Name:** Steve Meredith  
**Contact Email:** steve@northamericanalloys.com  
**Description:** North American Alloys is looking to buy excess inventories of usable titanium materials in all alloys and forms. Please contact Steve at 1-866-577-4161 or e-mail at steve@northamericanalloys.com.

**Titanium CP And 6-4 Secondary Usable Material**  
**Name of Your Company:** Affinity International, LLC  
**Contact Name:** John Li  
**Contact Email:** john1098@adelphia.net  
**Description:** We are looking for titanium CP and 6-4 secondary usable material or scrap material in big quantity. Such as slab, bar, plate, sheet and coils.

#### Products For Sale:

**Plymouth Tube Company**, manufactures titanium and steel extruded shapes for numerous industries, including aerospace, transportation, heavy equipment and machinery, food and dairy, pulp and paper, textile, architectural and medical industries. Call to find out how Plymouth Extruded Shapes can save you cost, labor and scrap. Website Address: [www.extrusions@plymouth.com](http://www.extrusions@plymouth.com)

**Titanium and Steel Extruded Shapes**  
**Name of Your Company:** Plymouth Extruded Shapes  
**Contact Name:** Gary Ezell  
**Contact Email:** gezell@plymouth.com  
**Description:** Plymouth Extruded Shapes is a member of the Plymouth Tube Company, manufactures titanium and steel extruded shapes for numerous industries, including aerospace, transportation, heavy equipment and machinery, food and dairy, pulp and paper, textile, architectural and medical industries. Call to find out how Plymouth Extruded Shapes can save you cost, labor and scrap. Website Address: [www.extrusions@plymouth.com](http://www.extrusions@plymouth.com)
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| Affinity International, LLC                      | Founded in 1984 the International Titanium Association is a nonprofit networking trade association for the titanium industry. The primary focus of the Association is to promote the continued growth of the industry as well as educate the public on benefits and implementation of using titanium. Current membership includes 100+ organizations.