In The News

New Literature

Search in Print '95

Materials Information (MI) presents a newly updated collection of Search-in-Print titles. These bibliographies on ferrous and nonferrous metals and alloys, ceramics, polymers, and composites are drawn from journal articles, conference papers, patents, books and reports.

In each Search-in-Print there are details of every item (including the English title, the authors, bibliographic source and original language) as well as, in many cases, an informative abstract (in English) summarizing the contents of the paper. Four Search-in-Print titles, as well as their order codes, that are of interest to thermal sprayers are listed below. The regular price (in 1995) for ASM or IoM members is $95.00.

Thermal Spray of Ceramic Coatings, Y715 Spray coating of ceramics onto metals by arc, laser, plasma, and powder methods; equipment, processes and methods.

Plasma Spray Coating of Steels, S703 Spraying of metals, powders, ceramics, and carbides for improved service life and high temperature and corrosion resistance.

Plasma Spray Coating of Nonferrous Alloys, G701 Spraying of metals, powders, ceramics, and carbides for improved service life and high temperature and corrosion resistance; covers Al, Co, Cu, Ni, Ti.

Microstructure of Thermal Spray Coatings, Y714 Analysis; effects of substrate characteristics on coating characteristics; alloying effects; effects on properties including wear and oxidation resistance.

Contact: Debbie Barthelmes, ASM International, Materials Park, Ohio, 44073-0002, USA. Phone: (216) 338-5151, Telex: 980-619, FAX: (216) 338-4634. Julie Lee, The Institute of Materials, 1 Carlton House Terrace, London SW1Y 5DB, England. Telephone: +44(0) 171-839-4071, Telex: 881-4813, FAX: 071-839-2289

Protective Coating Processes 1993-94

An international compilation of up-to-date reports on coatings and their applications is available in the 4th edition of the Industry Report, **Protective Coating Processes 1993-1994**. Published by Materials Information, this Industry Report provides a comprehensive overview of research activity related to protective coating materials and application processes to meet the requirements of specific industries worldwide. The report provides a guide to the assessment, selection and practice of thermal spray and deposition coating technologies. Through case histories of actual commercial experiences and production systems, the report features advances in optimizing protective coating materials and processes, as well as the latest developments in process control methods and systems. This Industry Report is based on a comprehensive search of the METADEX (Metals Abstracts/Metals Abstracts Index) and EMA (Engineered Materials Abstracts) Materials Information databases from June 1993 to May 1994.

The six sections in the report offer extensive coverage of commercial applications and innovations in thermal spray coating; specifically, arc, plasma, flame, powder, wire spray procedures, and deposition coating systems; electrodeposition, arc deposition, vapor deposition, plasma-assisted deposition, vac-uum deposition and plating processes.

Each section of **Protective Coating Processes 1993-1994** opens with easy-to-use tables displaying the corporate sources used for information or advanced materials gathered for the report. The tables serve as a directory to the spectrum of protective coating materials cited and to the individual manufacturers, supplier companies, universities, institutes and associations involved in related research and commercial enterprises worldwide.

A PC diskette for the report comes with the print version and includes the entire database of documents in the reference section. The diskette offers expanded search capabilities so the user can search the documents by word or group of words, or to restrict the search to a specific subset of references.

To order Protective Coating Processes 1993-1994, $340 (North America), £190 (EC), $390 (Other countries), please contact Ms. Debbie Barthelmes, Materials Information, ASM International, Materials Park, OH 44073-0002, USA. Telephone: (216) 338-5151, ext. 532. Fax: (216) 338-4634. Or contact Ms. Julie Lee, Material Information, The Institute of Materials, 1 Carlton House Terrace, London SW1Y 5DB, England. Telephone: +44(0) 171 839 4071. Fax: +44(0) 171 839 2289.

Handbook of Ternary Alloy Phase Diagrams

The most comprehensive collection of phase diagrams to date, the *Handbook of Ternary Alloy Phase Diagrams*, is in the final stages of publication from ASM International. The 10 volume set will include more than 15,000 ternary diagrams.

The handbook will serve as a valuable resource for those involved with R&D, alloy development, failure analysis and critical evaluation of remaining ternary systems. The diagrams have been redrawn to a uniform standard and scale, all degrees are given in Celsius and all compositions are given in atomic percentages. The angles between composition scales in all horizontal views have been standardized at 60 degrees, and most composition scales are identical within a diagram. The binary areas have been adjusted to agree with the systems published in *Binary Alloy Phase Diagrams* (ASM International, 1990).

Every diagram in the *Handbook of Ternary Alloy Phase Diagrams* has been either critically evaluated or edited by at least two of the editors.

The technical team overseeing the project includes: Dr. Pierre Villars, chief editor who became involved in 1987 when ASM learned he had collected more than 43,000 alloy phase diagram reference sources while preparing his update to *Pearson's Handbook of Crystallographic Data for Intermetallic Phases*; Dr. Alan Prince, a well-known metallurgical and phase diagram expert who served as editor-in-chief of the ASM/NIST Data Program for ternary and higher-order systems, as well as editor for many other phase diagram publications; and Dr. Hiroaki Okamoto, who served as co-editor of the three-volume set of *Binary Alloy Phase Diagrams*, Second Edition, along with several other phase diagram publications.

In principle, all existing equilibrium diagrams of all ternary alloy systems that were published through 1989 are intended to be included, with the exception of those containing oxygen, halogens or noble gases. The *Handbook of Ternary Alloy Phase Diagrams* features liquidus and solidus projections, isothermal sections, and vertical sections, along with crystallographic data on the phases. Some of the areas of the diagrams were magnified for clarity, and when needed, a schematic drawing of the region was added. The diagrams were all checked against the phase rule with corrections made as necessary.

Contact: Member/Customer Services Center, ASM International, Materials Park, OH 44073. Phone: (216) 338-5151, ext. 632. Fax: (216) 338-4634. Please refer to # 7706NR.

Brochure for Surface Enhancement Technologies

Newly issued, completely updated Brochure #40 from General Magnaplate, Linden, NJ describes a complete line of "synergistic" surface enhancement coatings that put a harder-than-steel, dry lubricated non-stick surface on all types of metal parts. These coatings become a permanent, integral part of the metal surface and allow the substitution of abundant, less expensive or lighter base metals for costlier, harder or heavier metals. They are identified as "synergistic" since the resultant surface is superior in performance to the base metal itself or any of the individual components used in the enhancement technology.

Protection against abrasion, corrosion and wear are major benefits offered by the use of Magnaplate-applied surface enhancements. Coated parts resist buildup of adhesive materials. They resist chemical and atmospheric attack, improve mold release, material flow and sanitation with continually renewed lifelong lubricity, also eliminating the need for harmful cleaning chemicals. Many meet USDA and FDA codes for use in food and pharmaceutical plants,

Copies of the brochure are available free of charge from General Magnaplate Corp., 1331 Route 1, Linden, NJ 07036. Phone: (908) 862-6200. Fax: (908) 862-6110.

Metal Powder and Refractory Metals Directory Issued

The Metal Powder Producers Association (MPPA) and the Refractory Metals Association (RMA) have published a 24-page directory of leading suppliers of metal powders and refractory metals and products. 79 products are included.

Listings for metal powder manufacturers provide information on available granular, flake and specialty powders and products, along with manufacturing capabilities and special equipment. The directory also provides information on companies that supply refractory metals such as tungsten, molybdenum, niobium, tantalum, cobalt and rhenium. Both associations are members of the Metal Powder Industries Federation (MPIF), an international trade association serving the global interests of the North American powder metallurgy and contiguous industries.

For a free copy of the directory contact Metal Powder Industries Federation, 105 College Road East, Princeton, New Jersey 08540-6692. Phone: (609) 452-7700. Fax: (609) 987-8523.

Corrosion Testing Made Easy: the Basics

Corrosion Testing Made Easy: The Basics, authored by Dr. Ellis Verink, Jr., describes techniques and equipment that are basic to most, if not all, corrosion tests. It outlines the scientific and mathematical principles essential to successful test performance. An introduction to laboratory procedures and equipment is provided, including preparation of specimens and chemical handling, corrosion theory and technology, types of corrosion and corrosion testing, test result interpretation, and an extensive glossary of terms.

The cost to NACE members is $100.00. Contact: NACE International, P.O. Box 218340, Houston, TX 77218-8340. Phone: (713) 492-0535, ext. 81. Fax: (713) 579-6694.

The Science and Engineering of Thermal Spray Coatings

Dr. Lech Pawlowski (Nozay, France) gives a complete and concise description of the technology of thermal spraying, starting with a discussion of powder manufacturing and testing, followed by the techniques involved during prespray treatment. Currently applied methods of spraying, together with post spraying techniques, are also outlined. The book correlates coatings properties with their microstructure and processing parameters. A strong emphasis is put on practical advice (both current and future) concerning coating characterization techniques.

The broad coverage of this work will enhance its value amongst researchers and professionals using thermal spray technology in academia and industry. Students specializing in the field will also find it of great use.

The contents include; Introduction, Materials Used for Spraying, Pre-Spray Treatment, Thermal Spraying Techniques, Post-Spray Treatment, Physics of Thermal Spraying, Coatings Buildup, Methods of Coatings Characterization, Properties of Coatings, Applications of Coatings, Organization of a Spray Shop, References, and an Index.

Contact: Emma Levine, Phys. Sci/A4, John Wiley & Sons Ltd., Baffins Lane, Chichester, West Sussex, PO19 1UD, UK. Fax: +44 (0)243 531712. Price is approximately £65.00 / $104.00.

Software Publications

Thermodynamic Data

Version 2.0 of TAPP, the database of thermochemical and physical properties from E S Microware, contains properties of over 17,000 solid, liquid and gas substances for either a Windows or Macintosh computer. TAPP is a valuable resource for any engineer or scientist who uses materials property data in his/her professional activities. Properties include crystal structure, density, thermal expansion, elasticity, thermal conductivity, diffusivity, electrical resistivity, viscosity, surface energy, vapor pressure, specific heat, entropy, enthalpy, free energy, and more. Both organic and inorganic systems are included. The list price is $495.

Data sources are displayed with a click of a button. These include the JANAF tables, compilations by NIST, IUPAC, and other respected sources of property data. It is possible to customize input compounds and data, or supplement with data which is supplied by TAPP.

TAPP is more than a handbook on a disk. For example; need to find a material with a thermal expansion coefficient between 6 and 8 x 10^{-6}/K, a density less than 6000 kg/m^3 and a melting point above 1000 K? Use TAPP to generate a list of candidate compounds in seconds. Data displays are in the form of a spreadsheet. Enter a temperature and immediately recalculate materials properties at the temperature of interest.

Property values can be exported as tab-delimited files to be read by your spreadsheet, word processor or plotting application. The equations and coefficients used to calculate these temperature dependent properties are displayed at the click of a button and can also be exported.

Contact: Dr. Scott McCormick, President, E S Microware, 2234 Wade Court, Hamilton, Ohio 45013. Phone (513) 738-4773, Fax (513) 738-4407.

The Journal of Protective Coatings & Linings - Archives

JPCL ARCHIVES is the collected features and articles from 120 issues (10 years of data) of the *Journal of Protective Coatings & Linings*. JPCL ARCHIVES contains close to 1500 entries, with information on:

- Selecting the right coatings for industrial service environments, including chemical plants, refineries, water tanks, bridges, power plants, pulp/paper mills, etc.
- Dealing with lead-based paint
- Working safely in blasting and painting operations
- Cost-effectively managing painting programs
- Writing effective specifications and bid packages
- Measuring coating performance and much, much more!

JPCL ARCHIVES also contains popular monthly columns such as Problem Solving Forum, Anatomy of Paint, Applicator Training Bulletin, and Regulation News.

ARCHIVES' search capability has options to help find specific information. For example, look for articles containing a particular word. Or, look for articles that contain two or more terms within a specified number of words from each other. Use connecting terms like AND, OR, and NOT to further customize searches. Additional flexibility to search for words in different forms or tenses-such as "rusts," "rusting," or "rusted," is allowed in JPCL ARCHIVES by inserting wildcards (* and !) to help find these words in any number of variations. JPCL ARCHIVES for SSPC members costs $260.00.

Contact: JPCL, 2100 Wharton St. Suite 310, Pittsburgh, PA 15203. Phone: (800) 837-8303 Fax: (412) 431-5428

Conference and Meeting News

Adhesion Science and Technology

A series of International Congresses on Adhesion Science and Technology (ICAST) is planned to be held every three years. The first congress of this series will be held in Amsterdam, The Netherlands, October 16-20, 1995.

A special feature of ICAST is that each congress will recognize an individual whose contributions have had a major impact on the science and technology of adhesion. At the Amsterdam meeting it is opportune and appropriate to recognize Dr. Kash Mittal for his many and varied contributions to the profession of adhesion science and technology, on the occasion of his 50th birthday. Furthermore, Dr. Mittal's efforts with regard to the Journal of Adhesion Science and Technology will be recognized. Under his guidance, this journal has grown, since its conception 9 years ago, to become the most authoritative in its field.

The scope of ICAST covers, but is not limited to, the following topics: Adhesion mechanisms; Contact angle, wettability and adhesion; Surface modification of materials (relevant to adhesion); Surface and interface characterization of materials (relevant to adhesion); Adhesion aspects of thin films, thick films and coatings; Adhesion measurement of films and coatings; Adhesive joints; formation, testing and durability; Adhesion aspects of metallized plastics; Investigation of interfacial phenomena; Bio medical adhesion; Methods for improving adhesion, e.g. by coupling agents; and Particle adhesion.

Contact: ICAST '95, P.O. BOX 346, 3700 AH Zeist, The Netherlands, Fax: +31 3404 32081, e-mail: 100341.2372 @compuserve.com.

ASM - SAMPE - MPIF Concurrent and Co-Located Meeting

ASM International, the Society for the Advancement of Materials and Process Engineering (SAMPE) and the Metal Powder Industries Federation (MPIF) have joined together to present concurrent, co-located meetings in Anaheim California, 8-11 May 1995.

Over 450 technical presentations will be made during the week. The event combines ASM's 6th Advanced Aerospace Materials & Processes Conference

(AeroMat), the 40th International SAMPE Symposium and Exhibition and MPIF's 4th International Conference on Powder Metallurgy in Aerospace, Defense and Demanding Applications (ADDA). Because of the combined event, attendees may attend the other Society's sessions for a minimal additional fee. Joint sessions on topics of common interest are also planned.

The exhibition, to be held at the Anaheim Convention Center, will feature nearly 300 AeroMat and SAMPE exhibitors displaying their products and services.

Founded in 1913, ASM fosters the understanding and application of materials, networking opportunities and development, and distribution of useful reliable technical information through electronic media, publications, conferences, training programs and chapter activities.

SAMPE, founded in 1944, is an international education and scientific association dedicated to the advancement of new materials and processes. The Society sponsors technical conferences and exhibits, publishes proceedings and technical publications.

Formed in 1944 as a trade association to serve the interests of the North American powder metallurgy and contiguous industries, MPIF is the world's largest powder metallurgy trade organization. It is organized into six affiliated trade associations.

For information on AeroMat, contact ASM International, Member Services Center, Materials Park OH 44073 -0002. Phone: (216) 338-5151. Fax: (216) 338-4634. For information on the 40th International SAMPE Symposium and Exhibition contact Dr. Charles L. Hamermesh, Technical Director, SAMPE, PO Box 2459, Covina, CA 91722-3748. Phone: (818) 331-0616, extension 602. For information on the 4th International Conference on Powder Metallurgy in Aerospace, Defense, and Demanding Applications contact Mark Tarby, Manager, MPIF, Member & Technical Services, 105 College Road East, Princeton, NJ 08540. Phone: (609) 452-7700. Fax: (609) 987-8523.

NDE in the Nuclear and Pressure Vessel Industries

The 13th International Conference on NDE in the Nuclear and Pressure Vessel Industries will focus on addressing technical advances, state-of-the-art and actual applications of NDE techniques in the global nuclear power and fossil fuel plant industry. Sponsored by ASM International's Materials Testing and Quality Control Division and the Japan Power Engineering and Inspection Corporation (JAPEIC), the conference will be held at the Kyoto International Conference Hall in Kyoto, Japan, 22-25 May 1995.

Attendees at this four-day conference will learn the latest in flaw and fault detection in nuclear power facilities and all types of pressure vessels. Participants will be able to hear experts from around the world share information.

A plenary session with two presentations will kick off the conference. Dr. Kunihiro Iida, Shibaura Institute of Technology, Minato-ku, Tokyo, Japan will speak on "Possibility of NDE First" within the context of a nuclear power plant structure. A presentation on "International Cooperation for the Further Enhancement of NDE Technology" concerning the clean up of nuclear waste storage facilities will be given by Dr. Glenn Light, Southwest Research Institute, San Antonio, Texas, USA.

Attendees can choose papers from two parallel sessions. Sessions include: Role of NDE, X-ray Technology, Piping and Major Components, Reactor Pressure Vessel Inspection, Advanced Ultrasonic Inspection Technology, Performance Demonstration Initiative and Inspection Qualification Approaches, Electromagnetic Technologies, PISC III Experience, Advanced Inspection Technologies, Material Characterization, Steam Generators, BWR Reactor Pressure Vessel Inspection, Modeling for NDE Inspections, Turbine Inspection, Stress Measurement, and Control Rod Drive Mechanism.

Contact: Member Services Center, ASM International, Materials Park, Ohio, 44073-0002. Phone: (216) 338-5151. Fax: (216) 338-4634.

Fundamentals of Corrosion and its Control

"Fundamentals of Corrosion and its Control," a 3-day training course, will be held throughout 1995 at the Holiday Inn, Wrightsville Beach, NC; i.e., May 23-25, August 8-10, and October 24-26, 1995.

The program is aimed to benefit anyone who either does not have prior knowledge of corrosion or who desires a refresher course on the basics of corrosion, corrosion testing and corrosion control. Instruction will include the basic metallurgy of materials and the relationship to corrosion susceptibility, different corrosive environments, forms of corrosion, methods of corrosion control and their economics.

The course is sponsored by the LaQue Center for Corrosion Technology, Inc., Wrightsville Beach, NC. For further information or to register, contact Sherree Darden LaQue Center for Corrosion Technology, Inc., P.O. Box 656, Wrightsville Beach, NC 28480. Phone: (910) 256-2271. Fax: (910) 256-9816.

NTSC '94 Facts

The National Thermal Spray Conference in Boston drew some 1,559 registrants. The three workshops catered to a further 80 participants. The Proceedings of this 7th NTSC (titled "1994 Thermal Spray Industrial Applications" and edited by C.C. Berndt and S. Sampath) contained 126 papers and extended to 803 pages.

Posters for NTSC '95 - Houston

Chris Berndt of SUNY at Stony Brook has been made responsible by the Thermal Spray Society of ASM International to organize a "Poster Display for the 8th National Thermal Spray Conference" in Houston (September 11-15, 1995). The purpose of these posters are to orient students, as well as research and engineering institutions, to present visually exciting displays of thermal spray activities. The posters will be displayed in a prominent area within the conference venue. Prizes, to be solicited from industrial and laboratory sponsors of this display, will be awarded to students on the basis of their poster(s). Contact Chris Berndt (SUNY at Stony Brook, Department of Materials Science and Engineering, 105 Old Engineering, Stony Brook, NY 11794-2275. Phone: (516) 632-8507; Fax: (516) 632-8052. e-mail: cberndt@ccmail.sunysb.edu) if you have any thoughts or questions concerning this activity.

UTRON, Inc.

Background

UTRON, Inc. is a small, employee owned, Virginia based corporation founded in 1989. However, it did not become active until the spring of 1994. UTRON is dedicated to performing basic and applied research with both defense and commercial applications, primarily in the field of applied plasma physics. UTRON presently occupies 900 ft^2 of leased office space and 4500 ft^2 of laboratory space in Manassas, VA, with an additional 1000 ft^2 of machine shop space at a separate location in Manassas. By February 1995, UTRON expects to expand into 2000 ft^2 of office space and 8000 ft^2 of laboratory space.

The principals of UTRON and the scientific staff have worked collectively as a group for the past 10 to 14 years at GT-Devices, Inc., a subsidiary of General Dynamics Land Systems. General Dynamics closed GT-Device in the summer of 1994. The group has been regularly engaged in basic and applied plasma physics research with applications primarily for hypervelocity launcher technology. This technology has been proven to be very successful as applied to electrothermal launchers, electric light gas launchers, chemical light gas guns, electrothermal chemical launchers, and pulsed plasma thrusters. As a result of this research, UTRON personnel are experts at gun launching masses ranging in size from particulates to kilograms in velocity ranges >7 kilometer/sec.

With the new direction of the commercialization of defense research, UTRON, given a background of hypervelocity gun launchers, has somewhat of a formidable task. UTRON has identified several potential applications of the core technologies. As we learn more about advanced materials research we find we have more to offer than originally thought.

Commercialization

UTRON has identified several exciting areas for commercial application of plasma technology, and is aggressively pursuing government funding and commercial partners. UTRON will also continue to pursue projects which are strongly research oriented and primarily government funded. Such programs are expected to provide additional financial support and new technologies. UTRON anticipates the bulk of its future earnings however, to come from commercial products and services resulting from applications of plasma launcher technology. UTRON plans to finance development of these products and services through strategic alliances or other partnership arrangements, in conjunction with government funding such as the ATP, TRP, and SBIR, programs.

UTRON is actively pursuing joint venture partners to commercialize technologies that it originally developed for DOD. The UTRON principals have researched these technologies for the past 14 years and have been aware of these commercial applications for much of that time. It has only been since the formation of UTRON that we have been able to pursue commercialization of these technologies.

The core technologies on which UTRON will draw are electrothermal plasma discharges, high pressure combustion, pulsed power and electromagnetic launch. These technologies were originally developed by the principals for advanced hypervelocity launchers for DOD and for electric rocket thrusters and advanced wind tunnels for NASA. In addition to defense applications, they have direct applications to a wide range of industrial and commercial uses. These include: thermal spray for the application of coatings; removal of various coatings (such as paint) without damage to underlying substrates; hazardous waste disposal; plasma thrusters for space propulsion; and many others. In each of these areas, proper application of UTRON's core technology areas can provide specific technical advantages over existing techniques and practices.

Listed are a few comments regarding several of these application areas.

Thermal Spray: One of the most important parameters in the quality of thermal spray coatings is the velocity at which molten coating particles impact the surface to be coated. While attending the National Thermal Spray Conference recently in Boston it became apparent that the industry had approached a performance "barrier" with respect to velocity and certain other technical parameters of importance. Manufacturers of spray equipment go to great effort to increase particle velocity with only modest success. UTRON has identified an approach which has the potential to provide substantial velocity increases (perhaps a factor of two, to above 2000 m/s), along with better control of other important parameters such as the particle chemical and thermal environment during acceleration. It is generally accepted throughout the thermal spray community that higher velocities and tighter control of particle temperatures will greatly improve coatings, but current technology cannot readily attain the desired operating parameters. Improved spray devices capable of investigating the higher velocity regimes are needed to exploit this.

UTRON needs either research money from the government or to locate a commercial partner to put up seed money to develop this technology. Funding could also come from a joint venture with government and a commercial partner.

Coating Removal: Safely removing leaded paint from existing bridges and other steel and concrete structures is an environmental problem of critical national importance which is not being addressed satisfactorily by traditional approaches. UTRON proposes to remove paint and other coatings using a process which rapidly and efficiently removes thin layers in a repetitive process. The coating material is readily carried away in substantially gaseous form, which eliminates the mess and environmental hazards associated with traditional sandblasting. No paint residue is allowed to escape into the atmosphere. Coatings are removed under completely controlled conditions which protect the environment, and the many hundreds or thousands of tons of contaminated residue associated with traditional sandblasting is eliminated. Such a technique could also be used, for instance, to remove painted lines from roadway surfaces more safely and far more quickly than current practices allow.

Hazardous waste disposal: UTRON has several ideas for applying pulsed power technology to the elimination or reduction of toxic and other hazardous waste. One specific idea is removing leaded paint from existing sandblast residue. At present large quantities of these contaminated residues are await-

ing an economical way of cleaning prior to disposal or reuse of the sand.

For further information contact: UTRON, Inc., 8506 Wellington Road, Suite 200, Manassas, VA 22110. Phone: (703) 369-5552, Fax: (703) 369-5298, e-mail: 73553.1264@compuserve.com.

Process Control Development for the Spray Forming Process

Recent graduating Ph.D. student Rochelle Payne of The Johns Hopkins University has researched process control development for the spray forming process. Her research was conducted at the Naval Surface Warfare Center in Annapolis, MD under the supervision of Professor Bob Cammarata. Spray forming is an alternative alloy production technique to both conventional and powder metallurgy methods.

This process can produce material with microstructurally enhanced properties and also has the advantage of making near net shape products. In addition, the United States Navy decided to invest in a spray forming plant in 1987 because the process showed promise in making Ni-Cr-Mo superalloy piping at reduced costs. Besides the Navy, over 20 worldwide organizations have licensed spray forming technology from Osprey Metals, Ltd.; however only a few companies have been successful in marketing spray formed material. In addition to the economic viability of the process, one factor which limits the versatility of spray forming is the undefined relationship between the process parameters and the final part quality. In an effort to increase the flexibility of the Navy's spray forming plant in making a variety of quality parts, Rochelle's research has focused on relating the process parameters with the final part quality through the use of neural networks.

Mathematical modeling of the spray forming process has not yet been able to determine well-defined relationships between process parameters and produce quality, so neural networks were employed to more clearly define this relationship. Initial results indicated that neural networks were able to predict trends in quality parameters as expected, so further development was undertaken using a data set created specifically for neutral networks. In this data set, the process parameter values were intentionally varied in order- to produce materials with a variety of quality characteristics. Defining part porosity and overall material yield (fraction of original melt that becomes the spray formed part) as quality, it was found that not only can neural networks successfully predict trends in quality data, but they are about as accurate in predicting quality outputs as an experienced operator. The accuracy of neural network predictions was found to improve when the neural network was trained with a more appropriate combination of process parameter information.

A process controller was developed using the most accurate neural network and the result is a Windows-compatible software program that puts neural network predications within easy access for the spray forming plant operator. The information helps the plant operator plan runs and determine the best combination of run parameters for each run. This is particularly important because of the Naval Surface Warfare Center's recent investment in a Part-on-Call program in which the goal is to produce spray formed components in a "flexible manufacturing" environment.

Reprinted from: CNDE News, Center for Nondestructive Evaluation, The Johns Hopkins University, 102 Maryland Hall, 3400 N. Charles Street, Baltimore, MD 21218-1689.

Surface Treatment at NCEMT

Introduction

Surface treatment technology encompasses a wide variety of processes, including thermal spray, weld cladding and surface layer modification. These processes provide a protective layer that enhances the performance characteristics of the substrate material. Applications of surface treatment technology within the Navy/DoD include coatings, surface hardening, and various surface modifications, for corrosion, erosion, thermal, and wear protection. Components requiring surface treatment include ship hulls (corrosion protection), valves and shafts (erosion/corrosion), gun barrel linings (thermal and wear protection), aircraft engine components (corrosion/thermal protection) and landing gear (corrosion protection).

Some of these surface treatment technologies have been used for many years (e.g., plating) while others have evolved greatly in recent years through the development of new equipment and adaptation of computer-based monitoring and control systems (e.g., thermal spray, vapor deposition processes). The application of new coating/surface treatment technologies and advanced engineering methods to a traditional technology can enable the introduction of cost effective, environmentally compliant coating processes, as well as provide consistent and reliable coatings.

This will require the generation and dissemination of engineering data, the development of process/product models, development of a better understanding of process stream/feed-stock material interactions, the design and development of process controls, implementation of intelligent processing methods, or a combination of these. Toward this end, the National Center for Excellence in Metalworking Technology (NCEMT) Surface Treatment Technology initiative is focusing on providing computer-based methods for the selection of process parameters, analytical evaluation of product behavior during service, and validation of computer-based models using statistically designed experiments (Figure 1). Initial efforts have centered on thermal spray technology, identified as one of the most widely used coating processes in the manufacture and repair of Navy and DoD components. Future efforts will expand this methodology to include physical and chemical vapor deposition processes.

Technical Activities

Technology Review/Assessment: Survey results indicate that thermal spray, plating and welding are the most widely used surface treatment technologies within the Navy/DoD for the manufacture and repair of components. This assessment has also indicated that the development and application of advanced surfacing technologies for the Navy/DoD should focus in improving product quality and performance, reducing component acquisition costs, and enhancing compliance with environmental, health and safety regulations during manufacture and repair.

Process Modeling: The modeling of the effects of input parameters on transport phenomena within the torch, spray and substrate regions of plasma and hypersonic flame spray processes is currently underway. The models provide improved understanding of thermal spray process fundamentals such as process

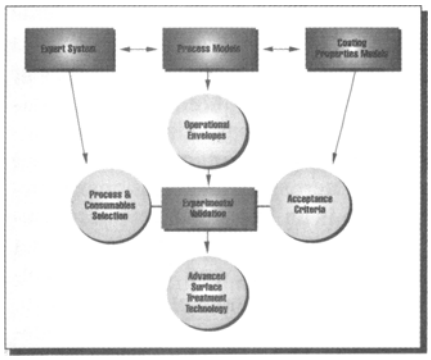


Fig. 1 The NCEMT technical approach to advance surface treatment technology.

stream/particle interactions and in-flight particle dynamics. The model results are used in conjunction with statistical design experiments to select an operational window for producing high-quality plasma spray coatings.

Coating Modeling: Methods are being developed to evaluate coating performance, with the goal of optimizing specific characteristics to produce high-integrity coatings for specific applications (thermal barrier, corrosion protection, erosion, wear). Additional models will be generated to quantify the effects of coating parameters on residual stress distribution, crack initiation and propagation, fatigue life, thermal creep, fracture and impact strength.

Expert System and Engineering Database: This development is an outgrowth of the process/product modeling efforts. For example, the expert system takes inputs based on the desired wear resistant properties of the coating and recommends the appropriate coating process and consumable to be used. The Engineering Database includes a multimedia-based interactive software program for providing education and training on appropriate deposition techniques to plasma spray operators.

To date, the NCEMT has developed the following computer based tools for plasma spray technology:

- A multimedia-based interactive information database to provide education and training on application techniques to plasma spray operators
- A knowledge-based expert system to select the thermal spray process and consumable for wear-resistant applications
- A one-dimensional plasma spray process model to enable one to select and optimize process parameters for producing high-integrity coatings
- A "product" model relating substrate and coating characteristics to limit interface crack propagation
- An interactive software program to enable one to select and apply a non-destructive test method to determine the thickness of different types of plasma spray coatings
- Non-destructive test methods and procedures to detect disbonds in plasma spray coatings

Contact: the National Center for Excellence in Metalworking Technology, Concurrent Technologies Corporation, 1450 Scalp Avenue, Johnstown, PA 15904. Phone: (814) 269-2731.

Nano-Sized Ceramic Powders

Advanced ceramics are inorganic, nonmetallic materials comprised of fine-scale microstructures which are known for their purity, complex compositions and crystalline structures. The manufacture of advanced ceramics requires processing and engineering far beyond that used in the creation of conventional ceramics. However, advanced ceramics represent a new generation of high-performance materials that hold the key to multi-billion dollar markets. Collectively, advanced ceramics represent a technology which is critical to the continued development of a host of high-technology applications ranging from modern microelectronics to high performance structure parts. Now a new material—nano-sized ceramic powder—is being developed.

According to a soon-to-be released BUSINESS COMMUNICATIONS CO. INC. study, "Advanced Ceramic Powders & Nano-Sized Ceramic Powders," the US market for advanced ceramic powders (including nanosized ceramic powders) was valued at $626 million in 1993. By 2000, the market is expected to reach almost $1.1 billion, reflecting an 8.3 percent average annual growth. Ceramic powder is a necessary ingredient for most structural ceramics, ceramic composites, electronic ceramics and ceramic coatings. For advanced ceramic components, starting powder is usually of critical importance. Moreover, the performance characteristics of a ceramic component are greatly influenced by the characteristics of the ceramic powder.

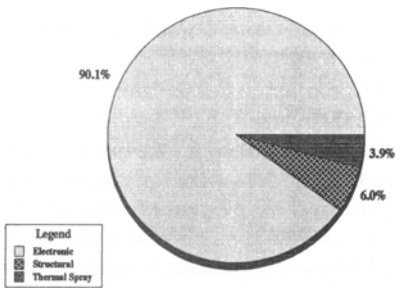
Electronic applications such as insulators, substrates, IC packages, capacitors, and magnets will dominate the advanced ceramic powders marketplace, accounting for over 90 percent of total powder usage. In 1993, electronic applications used advanced ceramic powders valued at over $563 million. By 2000, the market value of ceramic powders used in electronic applications will reach an estimated $977 million.

Advanced ceramic powders used in structural applications such as wear-resistant parts, cutting tool inserts and bioceramics are expected to experience the most rapid growth in usage. Accounting for advanced ceramic powder sales of $37.8 million in 1993, structural applications are expected to utilize approximately $83 million worth of advanced ceramic powders by 2000, reflecting 12 percent average annual growth. Use of advanced ceramic powders in thermal spray coatings (such as those used in aircraft engines) will grow only modestly in value at 3.5 percent annually to reach $31.1 million by 2000.

In the processing of advanced ceramics, there is a growing need to develop synthetic techniques capable of producing submicron, chemically pure powders with a narrow size distribution. However, new synthetic processing techniques are comparatively more expensive than the currently established powder manufacturing methods. Nevertheless, several new powder synthesis techniques have been developed in the past few years which may make production of these new powders efficient and cost effective.

Over the last ten years, US researchers have been attempting to develop technologies for the production of ultrapure and nano-sized ceramic powders. As the advanced ceramic industry upgrades manufacturing processes, these new powders should become competitive with those produced using conventional production techniques. Despite inflated estimates of huge future market demand for nano-sized ceramic powders, it is more likely that consumption will remain relatively small compared to that of conventional ceramic powders. Nevertheless, nano-sized ceramic powders do hold the greatest potential for future

U.S. Market for Advanced Ceramic Powders by Share, 1993



market growth. Although the powders are still in the developmental stages, there has been a recent surge of interest in nano-sized ceramic powders. Presently, over a dozen companies are supplying developmental quantities, while a few will soon be able to supply prototype and commercial quantities. However, many technical and business issues (including proper packaging and handling, processing, and high cost) must be resolved before nano-sized powders can be used in commercial applications.

In terms of global competition, tremendous inroads have been made by Japanese and European companies in the production of advanced ceramic powders. While the US still maintains a lead in some ceramic powder markets, the Japanese are leading in other areas of advanced ceramics R&D and in the commercial production of advanced ceramic components. In the last six years, the Japanese have penetrated the US advanced ceramic industry via acquisition, mergers, joint ventures and licensing agreements.

US Market for Advanced Ceramic Powders by Application*

	Millions of Dollars		AAGR (%)**
	1993	2000	1993-2000
Electronic	563.7	977 2	8.2
Structural	37.8	83.4	12.0
Thermal Spray	**24.4**	**31.1**	**3.5**
TOTAL	625.9	1 091.7	8.3

* From: "RGB-102R ADVANCED CERAMIC POWDERS & NANO SIZED CERAMIC POWDERS," Pub. OCTOBER 1994, PRICE: $2850.00.

** Average Annual Growth Rate.

Reprinted from: BUSINESS COMMUNICATIONS COMPANY, INC., 25 Van Zant Street, Norwalk, CT 06855. Contact: Randall K. Wakeford, Phone (203) 853-4266, Fax (203) 853-0348.

Sulzer Acquisition of Metco - an Open Letter

The acquisition of Perkin-Elmer's Metco Division by Sulzer has been approved by the US and European antitrust authorities and the transfer has been completed.

As of September 30, 1994, all Metco activities in surfacing materials and thermal spray coating systems will be taken over by Sulzer Limited in Winterthur, Switzerland, a Technology Corporation. In a first phase, Metco will report directly to the head of the Sulzer Surface Tech Division. Joint activities will start immediately under the new name of "SULZER METCO." This results in a rise of sales from 80 million (1993) to 240 million Swiss francs. Current personnel figures of 280 will increase to 886 with organizations in 17 countries around the world.

The integration process of Metco and Sulzer Surface Tech into the Sulzer Metco division will be completely by the first quarter of 1995.

This acquisition by Sulzer makes SULZER METCO the global leader in the thermal spray coating industry supplying high quality products and services to all relevant industry segments.

Howmet Plants Receives ISO 9000 Certification

Howmet announced that its Montreal, Quebec, and Whitehall (MI) casting plants have just received ISO 9002 certification. ISO 9002 is a quality systems model for quality assurance in production and installation, and part of the ISO 9000 series of standards. The certification was granted following a rigorous third-party assessment and accreditation procedure.

The Montreal plant joins Howmet Cercast's Cercor casting facility, located in Georgetown, Ontario, which received ISO 9002 certification earlier this year. The company's other casting plants—Ceramet, Bethlehem, PA; Cercon, Hillsboro, TX; Sigma, City of Industry, CA; and Ciral, Evron, France—are expected to obtain certification in the near future.

Howmet Cercast is choosing to obtain ISO 9002 certification largely in support of its customers, and because ISO 9002 registration is a growing global trend among quality suppliers in the aerospace industry.

Howmet Cercast is the world leader in the production of high-quality aluminum and copper-based investment castings, primarily for commercial and military aerospace applications. Howmet also is an important supplier of superalloy metal, titanium ingot and ceramic products, and advanced tooling; provides component refurbishment, hot isostatic pressing, precision machining and protective coating services; and conducts broad-scale research and development in materials, products and process technologies. Howmet and its affiliates have annual sales of over $800 million and operate 31 manufacturing facilities in the United States, Canada, France, the United Kingdom and Japan. Howmet is a member of the worldwide Pechiney Group.

HOWMET Corp., 475 Steamboat Road, Greenwich, CT 06836-1960. Phone: (203) 661-4600. Fax: (203) 661-042.

The World's Most Slippery Solid?

What's the world's most slippery solid? It's not a banana peel. It's not an eel. It's not a greased pig. It's not even a crooked politician-being interviewed by an investigative reporter.

According to the latest edition of *The Guinness Book of Records*, it's Hi-T-Lube®, a dry film lubricant for metals which is manufactured by General Magnaplate Corporation of Linden, NJ. However, it took a concerted drive by Walter Alina, General Magnaplate Vice President, to correct a long-standing error in the book which erroneously credited Dupont's Teflon as being the "world's most slippery solid." As a result of his efforts, the 1995 edition, soon to be in the bookstores, reports that HI-T-Lube®, with a reading of 0.03," has the "lowest coefficient of static and dynamic friction of any solid." ("Coefficient of friction" or "COF" is a scientific term used to designate the slipperiness of a material.)

Announcement of the recognition was made by General Magnaplate's President and Chief Operating Officer Candida Aversenti. She reported that this distinction was conferred only after Guinness's technical experts made an extensive search of the relevant litera-

ture and verified the claim with top metallurgists at leading UK universities.

The story begins in 1992 when Alina was browsing through his copy of the Guinness book. When he noted that Teflon was credited with being the world's most slippery solid with a COF of 0.02, he bristled. For one thing, in order for it to be meaningful, the COF must be described in terms of what two surfaces are in contact with each other; the Guinness citation did not do that. For another, he knew that while Teflon is very slippery, it also has a high "sticking" characteristic. He knew that this characteristic alone would make it virtually impossible for its COF to be as low as 0.02.

Alina contacted the Guinness office in New York and told them of his concern. He also sent along an inch-thick set of documents which proved that HI-T-Lube was more slippery. Alina heard nothing more, but did note that when the 1994 edition was issued, Teflon's COF had been changed to 0.04. At that point, he again contacted Guinness and noted that since Teflon had now been downgraded, HI-T-Lube® rightly deserved the "most slippery" honor. Guinness thereupon checked with its experts and decided to give HI-T-Lube its place of distinction.

HI-T-Lube® was developed for NASA in 1965 by Dr. Charles P. Covino, founder of General Magnaplate, to meet the extraordinary demands space missions impose on lubricants. Since then it has been a vital component of every US space project. It has helped us land on the moon, aided in the safe operation of the space shuttle, has been instrumental in the successful deployment and operation of numerous space satellites, and has made jet engine operations safer and more dependable. Now this dry film lubricant, whose wear surfaces consist of multiple layers of electrodeposited metals and alloys that are permanently bonded to the substrate metal, has also been adapted for more down to earth uses. It is applied to thousands of high-stress applications including gears, rollers, chains, threads, pistons, screws, nuts, bolts, engines, ball joints, and bearing surfaces and moving parts of all kinds on steel, stainless steel, copper, copper alloys, etc. It does not "outgas" in the vacuum of outer space and operates efficiently at compression loads in excess of 150,000 psi, at temperatures from −360° F to +1000° F.

Dr. Covino, now chairman and chief executive officer of General Magnaplate, is one of the world's leading experts in the surface enhancement of metals, having developed the concept of "synergistic" coatings in which the characteristics of the final product are superior to those of both the base metal and the coating material. He has been granted 85 patents and was honored a few years ago by being named to the New Jersey Inventor's Hall of Fame.

The Guinness citation under the classification "Physical Extremes" is on page 75 of the 1995 edition and reads:

Lowest friction The lowest coefficient of static and dynamic friction of any solid is 0.03, for HI-T-Lube with an MOS2 burnished (B) exterior. The 0.03 result was achieved by sliding HI-T-Lube (B) against HI-T-Lube (B). This material was developed for NASA in 1965 by General Magnaplate Corp. in Linden, NJ and has been used on many space projects.

Contact Candida Aversenti, President, or Walter Alina, Vice President, General Magnaplate Corp., 1331 Route One, Linden, NJ 07036. Phone: (908) 862-6200. Fax (908) 862-6110.

Recent Products

Thermal Spray & Brazing Consumables Literature

Praxair specialty powders, Indianapolis (IN) has published a series of technical brochures detailing the consumables they supply for the thermal spray coating and brazing industries. The seven-page brochure package outlines their powder products for plasma spray, HVOF, spray & fuse, PTA and laser cladding markets as well as their pastes, tapes, powders and preforms for the high temperature brazing market. Also included is a comprehensive list of products which have gas turbine OEM approvals.

Contact: Dean D. Hackett of Praxair Specialty Powders, 1555 Main Street, Indianapolis, IN 46224. Phone: (317) 240-2650. Fax: (317) 240-2225.

Miller Thermal Introduces New Thermal Spray Wire

Miller Thermal, Inc., has released a new arc spray wire ALLOY M, that employs a new metallurgical design using an iron-chromium-boron based alloy. Under surface friction, ALLOY M transforms from a crystalline to an amorphous/nanocrystalline structure to a depth of 2 to 5 microns. This creates a metallurgical structure very similar to that of glass. The glass-like surface has no grain boundaries and provides a very low coefficient of friction and significantly increased hardness. This metamorphic transformation continues throughout the life of the material.

ALLOY M is ideally suited to high temperature, low stress abrasion applications. The wire provides excellent erosion resistance with moderate corrosion protection. ALLOY M also has an excellent bond strength to a variety of substrates without a bond coat. The material is available for the arc spray process in 14 gauge, 25 lb. spools.

Miller Thermal, Inc., an Illinois Tool Works Company, is a full line manufacturer of thermal spray products and includes the Alloys International division at Baytown, Texas. Contact: Miller Thermal, Inc., N670 Communication Drive, P.O. Box 1081, Appleton, WI 54912 USA. Phone: (414) 734-9292. Fax: (414) 734-2160.

Miller Thermal Develops New Configuration Plasma Gun

Miller Thermal, Inc., has developed three new 40 kW subsonic configurations for its Model SG-100 Plasma Spray Gun.

These subsonic configuration assemblies improve both the life of the components and the deposition efficiency of the gun. An increased deposition efficiency of 15% was measured with Al-1075 and most competitors' powders. Greater deposition efficiency increases were measured with some Al-1075 cuts of powder. These benefits were obtained with minimal changes to existing spray parameters

The three different configurations are intended to cover the normal range of

applications. The 2083-720 and 2083-710 are for high velocity, subsonic applications. They both implement a vortex stabilized gas flow.

The 2083-730 is a laminar flow configuration for low subsonic applications (similar to the existing configurations as detailed in the Miller Thermal SG-1 00 Operator's Manual). The configuration is especially useful for ceramic applications, such as zirconia-yttria, and can be used for bond coat materials as well.

The 2083-710 and 730 are candidates for those applications using hydrogen as the plasma gas. Miller Thermal has patents pending on all configurations.

Miller Thermal, Inc., an Illinois Tool Works Company, is a full line manufacturer of thermal spray products and includes the Alloys International division at Baytown, Texas. Contact: Miller Thermal, Inc., N670 Communication Drive, P.O. Box 1081, Appleton, WI 54912 USA. Phone: (414) 734-9292. Fax: (414) 734-2160.

Professional News

Information Development/Delivery Committee

The Thermal Spray Society of ASM International has formed an "Information Development / Delivery Committee".

It is the mission of the Information Development / Delivery Committee to develop, compile and disseminate relevant, high quality, accessible information in a timely fashion consistent with the needs of the current and future thermal spray community. The Committee will conduct or support efforts in education, information of topical interest, broad based information of enduring interest and detailed information of immediate interest for specific applications. The committee will draw on the expertise available within the Thermal Spray Society and ASM to assure that Committee efforts are relevant to the community and consistent with Society goals.

Contact: Dr. William J. Brindley, NASA, Lewis Research Center, Building 106, Room 104, 21000 Brookpark Road, Cleveland, OH. Phone: (216) 433-3274. Fax: (216) 433-5544.

ASM Centralizes Answers to Technical Questions

To address technical questions from members and non-members, ASM International has created a new service, ASM Information Central. This fee-based service is designed to:

- Find and provide technical information on materials, processes and applications
- Provide consultation on technical problems
- Identify the ASM products and services relevant to a persons needs
- Locate hard-to-find information
- Assess the need for custom literature searches
- Refer the caller to an independent consultant, if and when necessary

Questions can be referred to Dr. Arun Jatkar who came to ASM in March 1994 to develop and operate ASM Information Central. He has served in several positions at the Aluminum Company of America as senior research scientist at the International Nickel Company, and as welding metallurgist at Advani-Oerlikon Pvt., Ltd., in Bombay, India.

Dr. Jatkar earned Bachelor of Science and Master's degrees in metallurgical engineering from the Indian Institute of Technology, Bombay, India and a doctoral degree in materials science and engineering from the University of Utah Salt Lake City, Utah. Dr. Jatkar may be reached at ASM Information Central, ASM International, Materials Park, Ohio 44073; Phone: (216) 338-5151, ext. 661; Fax (216) 338-8091. Contact Laura Sprockett, (216) 338-5151, ext. 626, to request feature information that details ASM Information Central.

ITSA Program in Denver

The Fall Meeting of The International Thermal Spray Association was held at The Scanticon Resort Center, Denver (CO) from October 6-8, 1994.

The program participants are listed below. Christopher Berndt of SUNY made a presentation relating to his University's capabilities and how they can help ITSA as well as a discussion of a new ASTM bond strength test. Then Keith Kempton of Exline and John Kaiser of Air Products presented information concerning their companies.

Jimmy Walker gave a video presentation of common applications that F.W. Gartner Thermal Spraying performs. Bob Unger of Hobart-Tafa and Pete Foy of Metco discussed the current status of their companies. A final Round Table discussion covered the topics for the next ITSA meeting in the Spring of 1995 in San Francisco.

AWS C2 Committee

The C2 Committee of the American Welding Society met in Carderock Division, Naval Surface Warfare Center Annapolis, on October 14.

This meeting, Chaired by Mr. E. Sampson, discussed the following sub-committee topics: C2A on "Machine Element Repair" (Bob Rigney), C2B on "Protection of Steel with Al and Zn" (Bob Sulit), C2C on "Coatings for Reinforced Concrete" (Mahlon Wixson), C2D on "The Thermal Spray Handbook" (Bob Rigney & Elliot Sampon), and C2E on "AWS Winter Conference and Show in Cleveland" (Michael Poe).

The morning meeting closed with a video presentation from Mr. John Streeter of Chile who shared his experiences on Thermal Spray Applications in Chile. John is an author and very much respected thermal spray applications engineer.

In the afternoon sub-committee's C2C, C2D & C2F convened to discuss the progress of their various documents. This AWS C2 Committee will meet again during the Cleveland Conference (April 4 and 5, 1995).

AWS Standard for Zinc Spraying Concrete

The AWS C2 Committee for Thermal Spraying is developing a process specification for applying zinc thermal spray coatings (Zn TSC) on reinforced concrete. The Federal Highway Administra-

tion states that cathodic protection of the rebar in reinforced concrete is the only means of arresting rebar corrosion. Zinc TSCs are used as sacrificial anodes for passive cathodic protection and for distributed anodes in active impressed current cathodic protection systems. California, Florida, Oregon, and other state and municipal DOTs are now specifying and using Zn TSCs for protection of bridge concrete structures. The AWS C2C Subcommittee for Zinc TSC for Concrete, is developing a process specification based on the principles of the technology and the lessons learned from bridge "metallizing" to date.

This AWS standard covers the application of Zn TSCs to concrete using arc spray equipment. This standard is formatted as an industrial process instruction. The scope includes: job description; safety; feedstock materials; equipment; a step-by-step process instruction for surface preparation, thermal spraying, and quality control. The major elements of the process are:

- Specifications and requirements
- Job reference standard
- Equipment setup and operation
- Surface preparation
- Zinc TSC application

Inspection and acceptance tests

Surface preparation requires clean concrete (no oil, grease, dirt, moisture, or loose material) and near-white metal surface finish (SSPC 10) for the exposed rebar. Zn TSC should be 0.020 ± 0.004 in. (500 ± 100 μm) thick, ≥ 150 lb./in.^{2} (1 MPa) tensile bond, and be smooth and uniform with no blisters, cracks, coarse texture, loose particles, and exposed substrate. Planning factors for surface preparation and thermal spraying are summarized. The production steps are detailed with eight quality control check points including sampling schedule, visual inspection of surface finish steel coupon bend test to validate arc-spray equipment setup, ultrasonic Zn TSC thickness measurement, and portable adhesion testing with a 2 in. diameter disc.

A job-site (or job-section) pass-fail reference standard for both surface preparation finish (on concrete and exposed rebar) and Zn TSC, mutually agreeable to purchaser and contractor, should be developed during the pre-production validation demonstration of equipment operation, process procedures, and quality control. There are three non-mandatory annexes: job control record; thermal spray operator qualification and certification; and a portable adhesion testing method. This standard does not cover the design standards or recommended practices for cathodic protection systems.

The C2C Subcommittee completed this specification in December 1994 so that the C2 Committee could ballot it in the first quarter of 1995. A publication is expected in late 1995. The C2C Subcommittee members include equipment and material suppliers, service contractors to bridge spraying jobs, consultants and engineers from the Stony Brook Thermal Spray Laboratory and Brookhaven National Laboratory. For further information, contact Mahlon Wixson, Chairman C2C Subcommittee, Thermion Metallizing Systems, P.O. Box 2136, Silverdale, WA 98383-2136, Phone: (206) 692-6656. Fax: (206) 698-1539 or Bryan Lyons, C2 Secretary, American Welding Society, Miami, FL 33126, Phone (800) 443-9353, Fax: 305-443-7559.

New Center in Philadelphia

Drexel University's Center for the Plasma Processing of Materials (CPPM) announces its new Thermal Spray Technology Applications Center (TAC). Designed for industrial "problem-solving" the TAC is providing short and intermediate term thermal spray coating solutions for industrial problems. TAC is employing the results and expertise developed by the CPPM during 10 years of industrial research as its chief resources.

TAC initiatives include:

- Coatings to replace chromium plate.
- Tool & Die coatings for component life extension
- Aqueous corrosion-resistant coatings
- Polymeric corrosion-resistance coatings
- Automotive coatings
- New wear-resistant materials

Call for details of the TAC program, facilities and capabilities. Technical summaries are available for most application areas on request. Contact: Dr. Ronald W. Smith, Mr. Michael Kim, or Dr. Richard Knight. Phone: (215) 895-1844 or 1990. Fax: (215) 895-2332.

PEOPLE IN THE NEWS

New Trustees to Serve for ASM International

Three new trustees have been named to ASM International's Board of Directors. The three trustees nominated to serve a three-year term until 1997 are:

Prof. Merton C. Flemmings, head of the Department of Materials Science and Engineering at Massachusetts Institute of Technology (MIT). Flemmings has been an ASM member since 1960 and recipient of numerous ASM awards. He was elected ASM Fellow in 1976.

Dr. Kishor M. Kulkarni, president of Advanced Metalworking Practices, Inc., Carmel, Ind. In 1975 Kulkarni became an ASM member and was elected Fellow in 1989. He has continuously served on ASM committees since 1975 and organized the ASM-IIM Visiting Lecture Program in 1979.

Dr. William Wallace, director of Structures, Materials and Propulsion Laboratory of the Institute for Aerospace Research of the National Research Council of Canada. An ASM member since 1970 and elected Fellow in 1988, Wallace is past chairman of the ASM Ottawa Valley Chapter. Wallace has chaired and co-chaired several conferences throughout his career.

Still serving their terms on the Board of Trustees are: Dr. Aziz I. Asphahani, Cabval Service Center; Dr. Linda L. Horton, Oak Ridge National Laboratory; Ash Khare, National Forge Company; Dr. Gernant E. Maurer, Special Metals Corp.; Dr. Alton D. Romig, Jr., Sandia National Laboratories; Merle L. Thorpe, Thorpe Thermal Technologies, Inc.

Andrews Assumes Presidency of ASM International

John V. Andrews, president of Teledyne Allvac, Monroe, NC, assumed the duties of ASM International president for the 1994-95 term during Materials Week '94 in Rosemont (IL).

On 4 Oct., Andrews succeeded Dr. Jack G. Simon, Associate Director of the Office of Naval Research - European Office as well as European Liaison for General Motors and the 170 member companies of the National Center for Manufacturing Science, the 1993-94 ASM president. Simon will continue to serve on the ASM Board of Trustees for one year as immediate past president and trustee.

Elected as an ASM Fellow in 1990, Andrews has served as ASM Trustee from 1988-91 and as a member of the ASM Finance Committee from 1981-88. He is a 25 year member of the Carolinas Southern Piedmont Chapter of ASM International.

Andrews holds Board of Directors positions with several organizations in North Carolina. He is also a member of the Forging Industry Association and the Specialty Steel Industry of the United States. In 1984 Andrews was named Union County, North Carolina, Executive of the Year.

Before Joining Teledyne Allvac, Andrews served in the US Army Ordnance Corps and worked at R.H. Bouligny in Charlotte, NC.

Quist Elected as Vice President of ASM International

Dr. William E. Quist, a Principal engineer for The Boeing Commercial Airplane Group (BCAG), Seattle, Wash., assumed the duties of 1994-95 vice president of ASM International on 4 Oct.

As vice president, Quist will assume the duties of president for the 1995-96 term. His selection was made by a nine-member Nominating Committee of ASM International chaired by Dr. Stephen M Copley, Dean, Armour College of Engineering, Illinois Institute of Technology.

An ASM International member since 1961, Quist has held all offices of the Puget Sound Chapter and served as its chairman in 1973. From 1978-90, he served on ASM's Board of Trustees and in 1980 was elected a Fellow of ASM.

Quist has served on, and twice chaired, several national ASM committees and councils including the Membership Committee, Nominating Committee, Aerospace Council and three award selection committees.

Quist joined BCAG, the world's largest producer of commercial aircraft, in 1959. He has worked in various positions at BCAG, primarily in research, development, processing, fabrication and application of various metals and alloys to commercial aircraft.

ASM Treasurer McCardle Installed During Materials Week

Effective 4 Oct., Thomas R. McCardle, president and chief operating officer of Kolene Corporation, Detroit, Mich., succeeds Leo G. Thompson, president and chief operating officer for Lindberg Corporation, Rosemont, Ill., as ASM International treasurer.

McCardle will serve a one-year term as treasurer and financial officer, chairman of the Finance Committee, and member of the Investment Committee.

An ASM International member for 25 years, McCardle was elected fellow in 1991. Currently, McCardle serves as a member of the Finance Committee for ASM. He is also a member of the Chemical Coaters Association International and served as its national president in 1986.

McCardle joined Kolene in 1968. He has served in various capacities until becoming a member of the board of directors of the Kolene Corporation in 1985. He assumed his present position at Kolene in 1988.

Margaret M. Weir Named Director of Education at ASM International

ASM International has announced the appointment of Margaret M. Weir to the position of Director of Education. Weir's new position includes responsibility and accountability for ASM's technical divisions, conferences, expositions and training products and services.

With this new position Weir plans "to gain a better understanding of the educational and training process as it relates to our members and customers career enhancement."

Weir joined the ASM staff in 1974. During the past six years, she has been promoted to Manager of Expositions (1988), Manager of Development and Technical Divisions (1990), and Manager of Conferences and Technical Divisions (1992).

She is a member of the Council of Engineering and Scientific Society Executives (CESSE). Weir resides in Newbury, Ohio, with her husband Robert and two sons.

Robert Uhl Appointed as Director of New Service Development

To continue enhancing service to members, ASM International has named Robert Uhl as the Director of New Service Development. His new position will focus on understanding members' needs and on bringing new services to the Society.

"I want to be able to involve the members in designing new services that they request," Uhl said. "I welcome any input that members may have on what kind of products and services would help their career."

While at ASM Uhl has held several positions of varying capacities including Manager of Technical Divisions, Assistant Director of Member Activities and Director of Reference Publications. Uhl has also worked as a staff engineer at SAE and a high school physics teacher before coming to ASM in 1981.

Uhl received a bachelor' s degree in physics and math from Bethany College and has completed graduate work at Penn State University and Slippery Rock University. Uhl resides with his wife Sharon and four children in Chagrin Falls, Ohio.

Rossin Receives ASM International Award

Peter C. Rossin, Chairman and CEO of Dynamet, Incorporated, Washington, PA, has been awarded the prestigious Medal for the Advancement of Research. The Medal was presented to Mr. Rossin by ASM International at its 1994 Awards Dinner in Chicago on October 4, 1994. The award was presented "in recognition of significant leadership and support of research and development in the areas of metal-deformation proc-

esses, powder metallurgy and special-metals applications".

Mr. Rossin received his BS in Metallurgy from Lehigh University, and his ME in Metallurgy from Yale University. After pursuing graduate studies at Rensselaer Polytechnic Institute, he began his career as a research engineer with the Remington Arms Company. He subsequently served in a variety of technical and management positions for General Electric Company, Cyclops Corporation, Fansteel Metallurgical Corporation and Crucible Steel Company. In 1967, Mr. Rossin founded Dynamet, Incorporated, and has received various awards for entrepreneurship resulting from the success of the company.

Dynamet, Incorporated, is a leading supplier of titanium and specialty alloy bar, coil, wire and forging products. Through its Dynamet Powder Products division, the company provides thermal spray and brazing powders, and consolidated P/M products for the aerospace and medical markets.

Contact: William B. Kent, Vice President and General Manager, Dynamet Powder Products, 600 Mayer Street, Bridgeville, PA 15017. Phone: (412) 257-5102. Fax: (412) 257-5154.

In Memoriam

Bob DiBattisto

Robert J. DiBattisto, 64, of Niantic, formerly of Glastonbury, died Sunday (Oct. 16) at his home. He was the beloved husband of Barbara (Burr) DiBattisto. Born in Pittsburgh, PA, Bob grew up in Manchester before moving to Glastonbury, and to Niantic 15 years ago. He was a 1953 graduate of Arnold College. He was a former part time teacher at South Catholic High School, Hartford, and retired from United Technologies in 1985 after 32 years of service, and recently retired from Electro Plasma Inc., of Irvine, California. Bob received the Distinguished Service Award in 1971 from the Diocese of Hartford for his work with the Deanery CYO. He officiated for many years at the high school and college level for football and high school basketball. He was the past president of the Giants Neck Beach Association. He was a devoted father and father-in-law to four children and their spouses, Steven R. and Christine DiBattisto of Newington, Diane Gott of East Hartford, Julie D. and Daniel Loftus of Colchester, and Cathi and Joseph Hartwig of Colorado; seven grandchildren, Shelly , Jeffrey, Sarah, Scott, Kevin, Bethany and Patrick; a great-grandchild: a brother and sister-in-law, Eugene and Jeane DiBattisto of Bradford, Vermont; two sisters, Marie Pechusick of East Hartford and Rita DiBattisto of Manchester; and several nieces and nephews. Bob is also survived by his mother-in-law and step-father-in-law, Eileen and Everett Martin of Bethlehem; his father-in-law, Harold Burr of Stephentown, NY; and a sister-in-law and her husband, Marilyn and Raymond Hardisty of Woodbury. He was predeceased by his parents, Dominic and Rose DiBattisto; two brothers, Albert and Donald DiBattisto and his brother-in-law, Nicholas Pechusick. Memorial donations may be made to either the American Heart Association, 5 Brookside Drive, Wallingford, or the Lyme Disease Foundation, 1 Financial Plaza, 18th Floor, Hartford 06103-2610.