



Environment

In the effort to preserve and maintain the fragile ecology of our planet, these recently selected abstracts are represented to help readers of the *Journal of Materials Engineering and Performance* stay current on legislation and compliance with global environment issues and regulations. They are reprinted from Metals Abstracts and Materials Business File with permission from Materials Information, a joint service of ASM International, Materials Park, Ohio, and the Institute of Materials, London, England.

Steel Policies: Foundation for Continuation of a Strong N.A. Industry. Policy positions of the U.S. members of the American Iron and Steel Institute (AISI), as directed toward the U.S. Administration and Congress, provide insight to key issues being addressed in regard to advances in the steelmaking industry. Public policy issues addressed by AISI are concerned with energy, environment, international trade, employee relations, tax policy, transportation, and national labs. Trends in the areas of energy and environment are discussed.

Cited: *Ind. Heat.*, Vol 62 (No. 11), Nov 1995, p 10, 12 [in English]. PHOTOCOPY ORDER NUMBER: 199601-S9-0007.

TEAM [Teamwork for Employees and Managers Act] Issue Dead but Hardly Forgotten. Since Feb 1995, the Teamwork for Employees and Managers Act (Team) has languished in the U.S. Senate Labor and Human Resources Committee, where it has received only one hearing. Committee sources say the bill is slated for another hearing sometime before the end of 1995. The bill would allow nonunion companies to form working committees to establish policies on worker safety, health, and productivity issues in an effort to enhance employee involvement and job satisfaction. Labor forces argue the bill creates a "sham" union that would determine the "terms and conditions of employment," while simultaneously discouraging legitimate organized activity.

N.E. Kelly. Cited: *Am. Met. Mark.*, Vol 103, 7 Dec 1995 (Suppl., Mini-Mill Steel), p 3A [in English]. ISSN 0002-9998. PHOTOCOPY ORDER NUMBER: 199601-S7-0016.

It's War on Radioactivity: The NRC Is a Willing Partner in Seeking Change. The U.S.-based Steel Manufacturers Association (SMA) is pressing for some U.S. federal action to reduce the risk of radioactive scrap making it into a charge bucket. This follows at least three dozen inadvertent smeltings of "hot" material over the years. There are 56 member companies of the SMA in North America, operating 123 steel plants, and virtually all their feedstock is in the form of scrap, in which a radioactive component may lurk. The U.S. Nuclear Regulatory Commission (NRC) is a willing partner in seeking change, having agreed to review the SMA's recommendations. There are ongoing discussions with industry scheduled for December and a public hearing will take place in Jan 1996.

E. Worden. Cited: *Am. Met. Mark.*, Vol 103, 7 Dec 1995 (Suppl., Mini-Mill Steel), p 10A-11A [in English]. ISSN 0002-9998. PHOTOCOPY ORDER NUMBER: 199601-S4-0005.

Fresh Victories for PVC. The Environment Minister for the state of North Rhine Westphalia has dropped his objection to the use of PVC in the construction industry. The move represents another significant victory for the PVC industry's fight against discrimination in Germany. Werner Preusker of the German association for PVC, the AgPU, indicated that there was still much to do to fully rehabilitate the material. The AgPU is working in concert with the ECVM in Brussels to re-establish a fair hearing for the material.

Cited: *Plast. Rubber Wkly.*, Vol 1610, 3 Nov 1995, p 3 [in English]. ISSN 0032-1168. PHOTOCOPY ORDER NUMBER: 199601-P4-0003.

SPI Urges Repeal of Clean Air Act Provisions. Speaking on behalf of SPI in July 1995 before the U.S. House of Representatives Commerce subcommittee on oversight and investigations, M. Seymour of Lasco Products Group, Anaheim, California, USA, told the House panel that sections 112(g) and 112(j) of the act are well intentioned, but they have the effect of punishing facilities rather than encouraging timely regulation. Since other provisions of the Clean Air Act adequately ensure that toxic emissions will be well controlled, sections 112(g) and (j) achieve little environmental benefit at a great cost to both the facility and the state permitting authority. Section 112(g) requires anyone who modifies, constructs, or reconstructs a major source facility that emits hazardous air pollutants to ensure that the facility achieves maximum achievable control technology (MACT) emissions limitations, whether or not a MACT standard has been promulgated by the Environmental Protection Agency (EPA). If no MACT standard has been promulgated, the facility must develop a case-by-case MACT standard. Section 112(j) requires facilities to file an application for a Title V permit or for a significant modification of its previously issued permit, containing emissions limitations based on a case-by-case MACT determination, if EPA fails to promulgate a MACT standard by the date established by the agency. The EPA is behind schedule on MACT standards due out in Nov 1994 and that work on MACT standards due out in 1997 and the year 2000 has been postponed. Industry members, therefore, will be compelled to develop case-by-case MACTs under 112(g). Sections 112(g) and (j) have the effect of shifting the burden of developing MACT standards from EPA, whose obligation and expertise it is to set standards, to a facility whose primary function is to produce materials for sale.

Cited: *Plast. Eng.*, Vol 51 (No. 10), Oct 1995, p 6 [in English]. ISSN 0091-9578. PHOTOCOPY ORDER NUMBER: 199601-P4-0001.

Photocopies of complete articles are available from the MI Document Delivery Service at ASM; please call 216/338-5151 ext. 450 for order and price information.

Furthermore...

The National Technology Transfer Center (NTTC) has been designated as a *key distribution point for Bridge to a Sustainable Future: National Environmental Technology Strategy* issued by the White House. Interested parties may receive a copy of the National Environmental Strategy by calling the NTTC at 800/ENV-6676. The information also is available via the NTTC's Business Gold on-line information system and on the Internet at World Wide Web URL <http://www.nttc.edu>. For further information, contact National Technology Transfer Center, Wheeling Jesuit College, 316 Washington Ave., Wheeling, WV 26003; tel: 304/243-2455; fax: 304/243-2463.

Environmental Reporting, Recordkeeping, and Inspections: A Compliance Guide for Business and Industry features an overview of federal environmental laws, step-by-step procedures for complying with the recordkeeping and reporting requirements of each federal environmental regulation, emergency planning, effective recordkeeping practices, the use of record in environmental auditing, and the role of record in inspections. Sample forms, checklists, and case studies designed to facilitate compliance appear throughout. For further information, contact Van Nostrand Reinhold, 115 Fifth Avenue, New York, NY 10003; tel: 212/254-3232; fax: 212/475-2548.

The University of Arizona was declared the *winner of the 1994-1995 Plastics Recycling Competition*. The competition is sponsored by a partnership between the American Institute of Chemical Engineers (AIChE) and the American Plastics Council (APC). The students were asked to respond to the challenge of creating a process for recycling waste plastics into value-added marketable products. The judges based their final decision on how well the students addressed a variety of recovery rates, and if market conditions could realistically accommodate the end-products of the process.

Additionally, the students' design had to be environmentally sound in that any hazardous by-products of their design must be controlled and minimized. This was an aspect of the University of Arizona team's design that was particularly insightful. Their design combined both mechanical recycling processes as well as a dissolution process and was chosen for its versatility to incorporate future technologies and economic changes. The HDPE, PUT, and PVC were diverted from the plastics waste stream for mechanical recycling while the remaining resins went to a fluidized bed where they were converted to basic petrochemical feedstocks. For further information, call 212/705-7328. For a copy of the paper call 202/296-0263.

Recycling of PVC and Mixed Waste, Prof F.P. La Mantia, Editor, assembles a group of international experts in these areas who provide their views on *possible solutions and the most important problems that must be resolved to recycle effectively*. In the case of PVC, the most attention is given to additives that complicate PVC reprocessing. The book also contains thorough examples of performing, automatic systems capable of processing large quantities of PVC waste on an industrial scale. Compatibilization is one of the key techniques used in the processing of mixed plastics and is covered extensively. The book also covers potential applications and current trends in the manufacturing and processing; this book is important for anybody involved in the chain of polymer/plastic synthesis, manufacture, processing, and use. For

further information, contact ChemTec Publishing, 38 Earswick Dr., Toronto-Scarborough Ontario M1E 1C6, Canada; fax: 416/265-1399.

A top official of the U.S. Environmental Protection Agency (EPA) said that the *steel industry's UltraLight Steel Auto Body (ULSAB) could reduce the amount of steel used in automobiles by 2 million tons/yr*, producing "obvious and tangible" environmental benefits resulting from using "materials more efficiently, in part by reducing the amount of material that will one day become waste." Elliott P. Laws, assistant administrator, Office of Solid Waste & Emergency Response for the EPA, said, "With 14 million vehicles produced in the United States annually, complete adoption of the design changes (in the ULSAB) by the auto industry could result in the reduction of the amount of material used," said Laws. Phase I of the ULSAB research and development project produced a design for the body structure (body-in-white) of a typical, mid-size, five-passenger sedan that would weigh as much as 35% less than current designs. The body-in-white is the vehicle's skeletal structure without powertrain, suspension, doors, interior, and other components. For further information, contact American Iron and Steel Institute, 2000 Town Center, Suite 1900, Southfield, MI 48075-1138; tel: 810/351-1757; fax: 810/351-2691; E-mail: ULSAB@Steel.ORG.

The Institute of Scrap Recycling Industries, Inc. (ISRI) has published its *Storm Water Guidance Manual*, created to assist scrap processing and recycling facilities in complying with storm water permitting requirements. The manual features detailed guidance on preparing a storm water pollution prevention plan (SWPPP) and specific information on the identification and implementation of industry-specific best management practices (BMPs)—both standard requirements in all permits. It also includes model SWPPPs based on the federal baseline general permit and the Environmental Protection Agency's (EPA) multisector permit, as well as a comparison of more than 50 industry-specific BMPs based on costs, practicality, limitations, labor requirements, and ability to control specific pollutants. Guidance on storm water monitoring requirements and procedures, listings of additional sources of assistance, and copies of required forms and compliance checklists are also provided. For ordering information, call 202/737-1770 or fax your request to 202/626-0900.

The Institute of Scrap Recycling Industries, Inc. (ISRI) has scheduled its *ninth annual convention and exposition for 20-24 April 1996*, at Marriott's Orlando World Center, Orlando, FL. The convention will build upon many of the innovations introduced at ISRI's 1995 convention, while adding even more opportunities for education and networking, as well as special events and headliner entertainment. ISRI's Scrap Recycling Industry Exposition, the largest trade show in the industry, will feature extensive indoor space at the Marriott plus adjoining outdoor space for oversize equipment and exhibits. The exposition will be open a total of 15 h during the convention, including two-and-a-half hours on 22 April with no competing programs, and will be the site of the opening reception and a special luncheon during the convention.

BIRL, Northwestern University's industrial research laboratory, announces the launch of its Industrial Group Program on *viable*

alternatives to electroplated chrome for industry and is inviting companies to join the group. In the Industrial Group Program, BIRL and participating companies will work as partners to assess the commercially available alternative processes and transfer them directly to the production floor. The Program on Coating Alternatives to Electroplated Chrome will focus on: assisting member companies in identifying the best commercial alternatives for their products and in putting them into production and measuring properties and assembling a database of engineering information on those specific alternative processes and materials of most use to the members. A parallel program for chrome platers wishing to ensure compliance with increasingly stringent environmental and workplace regulations will concentrate on technologies for cleaning up the existing hard chrome process. In government-funded programs totaling over \$2 million during the past 3 years, BIRL has been evaluating both chrome plating cleanup and chrome alternatives. For further information, contact: Keith Legg, BIRL; 708/467-1572; fax: 708/467-1022; E-mail klegg@nwu.edu.

Battelle has won a major contract with the U.S. Environmental Protection Agency to develop and demonstrate technologies for the National Risk Management Research Laboratory. The five-year task order contract has a ceiling of approximately \$10 million. Battelle researchers will be responsible for **expanding the number of contaminants that can be treated by bioventing and other technologies at both public and private sites** throughout the world. These contaminants include hydrocarbon fuels, jet fuels, metals, chlorinated solvents, explosives, oils, lubricants, degreasers, and PCBs. Bioventing is a method of cleaning contaminated soil by pumping air into the ground and strengthening the soil's bacterial action. The bacteria, in turn, ingest the contaminants and render them harmless.

Battelle has also won an **environmental remediation contract valued at up to \$50 million with the Naval facilities Engineering Command**. Under the Remediation Action Technology Implementation contract, Battelle will assist the Navy in developing, testing, and demonstrating technologies for remediation of hazardous wastes. As a prime contractor, Battelle's task order contracts have a combined ceiling of \$38 million over five years. Battelle also is a subcontractor on another contract with a ceiling of \$15 million. Battelle will help researchers at Tyndall Air Force Base's Arm-

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A consortium of at least **30 of the world's leading steel companies** is preparing to **invest \$20 million over two years to construct demonstration auto bodies to prove steel's continuing preeminence for the world's next generation of autos**. Based on the just-completed design and engineering phase of the consortium's UltraLight Steel Auto Body (ULSAB) research and development project, the body structures ("body-in-white") will validate the design for weight, manufacturability, rigidity, affordability, and other performance criteria. The new steel auto body concept promises to reduce the weight of the body structure by up to 35%, lower cost by 14%, and improve torsional rigidity by as much as 132%, compared to a range of current vehicles in the four-door, mid-size class. For further information, contact American Iron and Steel Institute, 2000 Town Center, Suite 1900, Southfield, MI 48075-1138; tel: 810/351-1757; fax: 810/351-2691.

strong Laboratory in Panama City, FL, develop several technologies that will enable them to treat contaminated soil and groundwater on-site. These technologies will include determining the effectiveness of bioventing technology for remediating soil contaminated by nonpetroleum hydrocarbons. For further information, contact Battelle, 505 King Avenue, Columbus, OH 43201-2693; tel: 614/424-5544; fax: 614/424-3889.

Researchers at the **Hoechst Celanese Advanced Materials Group (AMG)** have found that **a recycled blend of the resins found in today's automobiles is actually stronger than the original material**. A recycled blend of Celcon acetal copolymer and polypropylene (PP) can match and in some cases exceed the properties of virgin PP. Specimens molded from a blend of unfilled polypropylene containing up to 15% unfilled Celcon lost no tensile strength compared with virgin PP. Blends of mineral-filled polypropylene and up to 15% Celcon actually produced somewhat higher tensile strength. In both cases, flex modulus of the blend increased, although elongation and toughness suffered some decrease. For further information, contact Advanced Materials Group, Hoechst Celanese Corporation, 90 Morris Avenue, Summit, NJ 07901-3914; tel: 908/598 4161; fax: 908/598 4165.

A new system that **provides a low-cost method of reducing emissions of volatile organic compounds (VOCS) from chemical compounding mixers and reaction vessels** is described in literature available from **Liquid Carbonic**. The patented Head Space Vapor Condensing System (HSVCS) reduces VOC emissions by lowering reaction vessel head space temperature with liquid nitrogen. This, in turn, causes solvent vapors to condense and return to the product as a liquid. The HSVCS is easily installed to most compounding mixers and reaction vessels without interfering with other equipment or processes. In addition to lowering worker exposure to toxic chemicals, the HSVCS system also increases control over compounding processes and product quality. Because the nitrogen used in the system does not make direct contact with the process vessel's atmosphere, it can be reused in other applications requiring an inert gas. For more information, request Form #7029 from Liquid Carbonic, Dept. TC, 3724 Crescent Court West, Whitehall, PA 18052; tel: 800/299-7977, ext. 937.

The **Aluminum Association** estimates that **aluminum shipments to North American passenger car producers in 1994 increased 15% over 1993**. The automakers used over 2.9 billion lb of aluminum in 1994, 386 million lb more than the prior year. The amount of aluminum used by the automotive industry annually has almost doubled in the last ten years. For 1994, largest mill-volume product increase came from sheet aluminum, which rose by 67 million lb over 1993. Extruded accounted for the most significant percentage increase, up nearly 45% over the previous year. For further information, contact The Aluminum Association at 202/862-5163.

According to a recently released **Business Communications Company, Inc.** study, **RGB180 "Markets for Metallizing Technologies,"** the total worldwide shipments of substrate materials for metallization reached 1.3 billion lb in 1994. Shipments are

forecast to grow by 8.9% and reach 2.3 billion lb by 2000. Polymers, such as polyester, polypropylene, and polycarbonate represent the largest volume of substrate material currently metallized. They are used primarily in the high volume specialty packaging and information storage industries. The value of polymer substrate shipments reached \$1.7 billion in 1994 and will have an average annual growth rate (AAGR) of 10.3% to reach \$3.1 billion by 2000.

Shipments of ceramic and glass substrates, used in microelectronics and information storage, were valued at \$162 million in 1994 and will have an AAGR of 15.6% to reach \$389 million by 2000, predicts BCC analysts. Shipments of silicon substrates for use in microelectronics applications were estimated at a value of \$212 million in 1994 and will increase to \$492 million by 2000, reflecting an AAGR of 15%. Other materials to be metallized, such as paper for packaging and decorative applications, aluminum and various composites for use in information storage and the industrial markets, will grow from \$475 million in 1994 to just over \$800 million by 2000, representing an AAGR of 9.1%.

Value of worldwide shipments of substrates to be metallized, 1994-2000 (million dollars)

	1994	2000	AAGR I%, 1994-2000
Polymers	1765.0	3189.7	10.3
Ceramics/glass	162.9	389.1	15.6
Silicon	212.5	429.3	15.0
Other	475.6	801.4	9.1
Total	2616.0	4872.5	10.9

U.S. copper mine production rose again to a new high 3960 million lb—according to “Annual Data 1994—Copper Supply and Consumption” published recently by the **Copper Development Association Inc.** Electrowon copper production remained

nearly even with last year at 1076 million lb, while smelter production at 3781 million lb represented an increase of 2.1%. Production of refined copper, at 4894 million lb, declined 1.4%, while the consumption of refined copper, at 5904 million lb surpassed last years gains, pushing up 13.5%—the largest single year increase in 10 years. Domestic consumption of mill products totaled 7564 million lb, up 12.7% from 1993. Exports of mill products in 1994 continued to grow also, up 9.6%, at 587.1 million lb, versus imports of 706.7 million lb, an increase of 31.8% over the previous year. Recycling of scrap resources, at 3549 million lb, was up 13.1% in 1994, reflecting 41% of the total U.S. copper supply, down 3% from last year's level. For further information, contact Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016; tel: 212/251-7200; fax: 212/251-7234.

According to a new study from **The Freedonia Group, Inc.** **world demand for thermoplastic resins will rise 4% per year to 122 million metric tons in the year 2000** due to a healthier global economy and improved end-use markets including construction and motor vehicles. Rising affluence in less-developed countries will stimulate consumption of consumer products that incorporate thermoplastics, as well as the substitution of plastics for traditional materials (e.g., metal, wood, glass). In terms of supply, industrializing nations such as Brazil, China, Mexico, and South Korea are expected to expand their production capacity in order to target the export market and service indigenous industries. However, the majority of the supply and demand for thermoplastics will continue to come from the United States, Japan, and Western Europe. Gains in the production of thermoplastics will follow consumption closely, also increasing 4% annually to nearly 125 million metric tons in 2000. The four leading commodity resins used in the production of thermoplastics are polyethylene, polypropylene, polyvinyl chloride, and polystyrene. These materials have deeply penetrated the market for traditional wood, glass, and paper products as a result of their versatility, durability, and light weight. For further information, contact the Freedonia Group, 3570 Warrens-

World demand for advanced ceramics (million U.S. dollars)

Item	1985	1994	2000	Annual growth, %	
				1994/1985	2000/1994
Advanced ceramics demand	5831	16,754	25,370	12.4	7.2
North America	2145	6,225	9,930	12.6	8.1
Western Europe	797	1,687	2,580	8.7	7.3
Japan	2675	8,070	11,580	13.1	6.2
Asia/Oceania excluding Japan	144	608	1,000	17.4	8.6
Other regions(a)	70	164	280	9.9	9.3

(a) Eastern Europe, Central and South America, Africa, and the Mideast. Source: The Freedonia Group, Inc.

U.S. supply and demand for abrasives products (million dollars)

Item	1985	1994	2000	Annual growth, %	
				1994/1985	2000/1994
Abrasive product demand	2990	3649	4225	2.2	2.5
Manufacturing markets	2381	2846	3311	2.0	2.6
Nonmanufacturing markets	609	803	914	3.1	2.2
Net imports	147	279	300	7.4	1.2
Abrasive product shipments	2843	3370	3925	1.9	2.6
Nonmetallic abrasives	2614	3096	3615	1.9	2.6
Metallic abrasives	229	274	310	2.0	2.1

Source: The Freedonia Group, Inc.

Global demand for advanced ceramics will rise 7.2% per year through the year 2000 based on their unique attributes of heat resistance, durability, desirable electric properties, and chemical inertness. However, growth has slowed as advanced ceramics still suffer from barriers to more widespread acceptance in mechanical applications, lack of industry-wide standards and variations from one supplier to another. Tougher and more fracture-resistant ceramics which "fail gracefully" are emerging from the laboratory into commercial production, which should help to overcome some resistance to their use. Analysts predict that intense marketing efforts will be required to convince potential users to switch from proven materials to ceramics from emerging uses such as heat engine parts and other demanding mechanical applications. A complete analysis of this market is available in a new study from **The Freedonia Group, Inc.**

The electronics market will continue to dominate demand for advanced ceramics, accounting for 70% of the aggregate. However, this market will be limited somewhat by the near-complete diffusion of ceramics in these applications. Freedonia's analysts believe that integrated circuits will provide the greatest growth opportunities, followed by capacitors. Structural ceramics will continue to be used most frequently in tool and die applications, spark plugs, wear parts (e.g., seals, bearings, valve parts, and the like), and ceramic substrates. In heat engine applications, ceramic parts are being gradually upgraded, but they face intense competition from metal parts that are far less expensive and offer continually improving performance. As a result, heat engines will continue to present a very problematic market. Advanced ceramics are expected to enter transportation and stationary heat engines incrementally in the form of less critical small components as opposed to a complete engine system. For further information, contact the Freedonia Group, 3570 Warrensville Center Road,

Despite level volume demand, price increases, and product upgrades will support dollar ***growth of 2.5% per year for abrasive products, reaching \$4.2 billion in the year 2000.*** Growth in abrasive product shipments will follow developments in demand, advancing 2.6% per year to \$3.9 billion in 2000. According to **The Freedonia Group, Inc.**, the number of end-use markets for abrasives will expand, but growth will be offset by trends such as the development of abrasives with longer lives and higher hardness, the use of alternative methods for cutting materials and better manufacturing processes. In addition, the increased use of plastics by durable goods producers will negatively impact demand because these materials require less finishing than metals. On a more positive note, durable goods producers are using harder metals and applying tighter specifications to parts. Such efforts should increase demand for superabrasives, which carry a higher price than traditional abrasives.

Manufacturing, the leading market for abrasives, will continue to account for nearly four-fifths of annual demand. Within this segment, commercial aerospace applications will promise the most rapid gains in the industry as the market recovers from a depressed 1994 base. The traditional industrial machinery market will also enjoy gains based on production advances. Among nonmanufacturing markets, consumer applications will remain strong with increased demand for use in more sophisticated projects leading to continued growth in the do-it-yourself arena. Meanwhile, however, consumer market abrasives are losing market share to plastic-based scouring pads. For further information, contact the Freedonia Group, 3570 Warrensville Center Road, Suite 201, Cleveland, OH 44122-5226; tel: 216/921-6800; fax: 216/921-5459.
