



University of Connecticut Institute of Materials Science



IMS Associates Program Newsletter

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Wei awarded K.C. Wong Fellowship

Mei Wei, Assistant Professor, Department of Metallurgy and Materials Engineering, has been awarded the K.C. Wong Fellowship by the Chinese Academy of Sciences for the year 2004. She has recently set up the cell culture facil-

ity for tissue engineering in the Materials for Biomedical Engineering Laboratory, the first biomedical facility in the Institute of Materials Science (IMS) at UConn.

New Faculty

Bryan Huey

Bryan Huey, Assistant Professor, arrived this summer to join the Institute of Materials Science with the Metallurgy and Materials Engineering Department as his academic home. He earned his B.S. in materials science at Stanford University in 1993, and completed M.S. and Ph.D. degrees in MS&E from the University of Pennsylvania in 1996 and 1999, respectively. Bryan's graduate work focused on novel surface potential measurements of ceramics using Atomic Force Microscopy (AFM). NSF and Marshall Sherfield post-doctoral fellowships then allowed him to pursue research at Oxford, UK, and EPFL, Switzerland to couple AFM and ultrasound for nanoscale mechanical measurements. Most recently, Bryan held a NRC fellowship at NIST in Maryland to investigate ferroelectric thin films.

Bryan oversees the new IMS NanoMeasurement Laboratories, with two new fluid-compatible AFM systems

as well as an ultra-high vacuum scanning tunneling microscope/atomic force microscope (UHV STM/AFM) system. Specific areas of interest and expertise are based on nanoscale surface measurements and manipulation of:

- Topography
- Electric Field (semiconductors)
- Surface Potential (varistors, other semiconductors)
- Converse piezoactuation (thin film ferroelectrics)
- Mechanical compliance (polymers to semiconductors)
- Cantilever dynamics
- Cantilever sensors

Ramanurthy "Ramprasad" Ramprasad

Dr. Ramprasad received his B.Tech. in Metallurgical Engineering at the Indian Institute of Technology, Madras, India in 1990. He obtained his M.S. degree in Materials Science & Engineering at the Washington State University

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in 1992, and his Ph.D. degree also in Materials Science & Engineering at the University of Illinois, Urbana-Champaign in 1997. After a post-doctoral stint at the Department of Physics & Astronomy at the University of New Mexico, Albuquerque, he has been with Motorola's R&D laboratories at Tempe, AZ, as a Senior Staff Scientist from 1998-2001, and a Principal Staff Scientist from 2001-2004. He will be joining the Department of Metallurgy and Materials Engineering as an Assistant Professor in the Fall of 2004. Dr. Ramprasad has authored or co-authored over 25 peer-reviewed journal publications, filed 4 patents, and has presented numerous conference papers and invited talks.

Dr. Ramprasad's research interests lie in the areas of Computational Materials Science and Materials Theory. His research areas are interdisciplinary, spanning Materials Science, Physics, Chemistry & Electrical Engineering. Areas of particular interest include: conduction & breakdown mechanisms in dielectric materials, surface & interface phenomena, catalysis, effective medium description of nano-materials including nanotube and dielectric & magnetic nano-composite materials, and photonic & acoustic band gap materials. He is also actively involved in the development of advanced theo-

retical methods that bridge length and time scales by linking quantum mechanics based methods (such as density functional techniques) with phenomenological methods, electromagnetic and acoustic wave propagation in crystals and parallel computing.

Peter Burkhard

This fall Peter Burkhard joins the Institute of Materials Science with the Department of Molecular and Cell Biology as his academic home. Peter earned his Ph.D. from the University of Basel, Switzerland, studying "Protein Ligand Interactions." This work was performed in conjunction with the pharmaceutical firm Sandoz. Peter stayed at the University of Basel as a post-doctoral researcher and most recently was a group leader in structural biology at the Biozentrum (Biochemical Department) of the University of Basel.

Dr. Burkhard's research interests are varied and include protein/enzyme crystallography, nanoscale science, structural biology, molecular biology, medicine and cell biology.

New Associates Program Members

Underground Systems Inc. (USi) provides products and services which improve the capacity, efficiency and reliability of electric power delivery systems. USi's three primary business units are: Monitoring, Rating, and Diagnostic Systems for Power Delivery; Custom Engineered Accessories for Power Cable, Transformers and Substation Equipment; and Engineering and Research Services. USi has manufacturing and testing locations in Connecticut and New York with satellite offices in Illinois. Bob Smith is the coordinator.

Enthone, part of Cookson Electronics, is rejoining

the Associates Program. The coordinator is Jay Conrod. Enthone is a worldwide leader providing high-performance specialty chemicals to the electronics, surface finishing, and decorative industries. Enthone manufactures, markets and distributes functional, decorative and electronic processes that are used in printed wiring board, semiconductor, automotive, aerospace, jewelry, and hardware and plumbing applications. Enthone is headquartered in West Haven, Connecticut and has facilities and offices worldwide.

There are now 33 members of the IMS Associates Program.

IMS Members inducted into the Connecticut Academy of Science and Engineering

Fotios Papadimitrakopoulos, Professor of Chemistry and Associate Director of the IMS, has been inducted into the Connecticut Academy of Science and Engineering. Professors Cooper (Chemical Engineer-

ing), DeWolf (Civil and Environmental Eng), Helble (Chemical Engineering), Javidi (Electrical and Computer Engineering) were also inducted.

Focus on Research

In each issue of this newsletter we profile one of the active research areas at IMS. In this issue we focus on the research being led by Pamir Alpay, Assistant Professor of Metallurgy and Materials Engineering. Professor Alpay is primarily interested in the fields of functional and smart materials. In particular, his research is concentrated on the thermodynamics and kinetics of phase transformations in thin films of such systems and multilayer heterostructures, the effect of internal stresses on the structural and physical properties of constrained films, and functionally graded smart materials.

Functional and smart materials are distinctively different from structural materials. Their physical and chemical properties are sensitive to a change in the environment such as temperature, pressure, electric field, and magnetic field. Functional materials utilize their native properties and functions to produce intelligent action. Examples cover a wide spectrum of materials systems including ferroelectrics, ferromagnets, semiconductors, superconductors, photonic crystals, and many

transition metal oxides with metal-insulator transitions.

Dr. Alpay's work at UConn is mainly concentrated on epitaxial and graded ferroelectric films. Compositionally graded films with enhanced properties through spatial variations in internal stresses, film composition, and microstructure are engineered and tested. Making use of the unique intrinsic characteristics of ferroelectric materials and introducing compositional and internal stress gradients, exceptional and unusual electrical and electromechanical properties can be obtained which are not possible for bulk ferroelectrics and ferroelectric thin films. Furthermore, there is also ongoing research on the relationship between microstructure including equilibrium defects such as misfit dislocations, internal stresses, and the physical properties of thin films of functional oxides.

More information can be found on Dr. Alpay's web page <http://www.ims.uconn.edu/~alpay/> or by contacting Professor Alpay directly (p.alpay@ims.uconn.edu).

Members Corner

In each newsletter we present a short description of one or two of our member companies. In this issue we focus on Dymax Corporation. We thank Nicole Langer of Dymax for this contribution.

DYMAX Corporation manufactures and offers a full line of solvent-free, environmentally friendly (non-toxic and non-flammable) aerobic adhesives, curing lamps and other equipment that lowers assembly costs while providing its manufacturing clients advanced assembly solutions. The Company supplies its proprietary line of value-added specialty adhesives and UV curing equipment to manufacturers of general industrial

goods, medical device manufacturers, electronic assemble houses, optical equipment companies and aerospace and automotive manufacturers. The Company's specialty adhesives allow its customers to reduce processing time and per unit production cost as well as improve overall product quality in a safe and environmentally friendly manner.

World Headquarters are in Torrington, Connecticut with subsidiaries in Goshen, Connecticut; Winsted, Connecticut; Frankfurt, Germany; Hong Kong and near Shanghai, in China. Dymax's products are qualified to the new ISO 9001/2000 quality standards.

Polymer Program Advisory Board Meeting

The Polymer Program Advisory Board Meeting was held on May 21. As part of this meeting a poster ses-

sion was held at IMS. Titles and authors are listed on page 10.

ASM/TMS Student Chapter

UConn ASM/TMS Student Chapter won the ASM/TMS Chapter of Excellence Award for Promotion for the academic year 2003. This award is considered the highest honor for an ASM/TMS Student Chapter. The award is \$500 cash and a plaque. The Chapter also placed first in the TMS World Materials Day Outreach Contest (hundreds of student chapters compete for this) for the 2003 academic year! The Chapter received \$1000 cash and a trophy. Mike Pasquariello retired as the chapter president after a three-year stint and Juan Villegas has been elected President. Other officers of the chapter are Neal Magdefrau, Sofia Iddir, Kai Song, and Chandrasekhar Kothapalli. Prof. Leon Shaw, faculty advisor to the chapter, led the outreach effort designed to interest middle school and high school students in the New England area via the fol-

lowing events: University Open Houses, Engineering 2000, Departmental Visitation Days, Connecticut Invention Convention, da Vinci Project, Connecticut Science Fair, and CPTV Family Science Expo, and Materials Week. A few local middle schools and high schools were also visited as part of the Materials Road-Show, which included lectures, hands-on demonstrations, and videos. As part of these efforts, the chapter performed the Outreach Show at North Haven Middle School (North Haven, CT) and at Wilbraham Middle School (Wilbraham, MA) in February 2004. On the fun side, the chapter conducted student speaking contests for the graduate and undergraduate students. Teaming up with the SPE chapter in IMS, the chapter members enjoyed outings at Margaritas and Bowling Nite.

International Conference on Engineering Failure Analysis

Emeritus Professor Art McEvily of Metallurgy & Materials Engineering Dept. and IMS Associates Program Director, Dr. Myer Ezrin, took part in this conference in Lisbon, Portugal, July 12-14, 2004. Attendees came from 34 countries, making it a particularly international conference. McEvily presented an oral paper, "Reverse Engineering Gone Wrong, A Case Study," about a plane crash due to an improperly manufactured metal part. Ezrin had a poster paper, "Gas Chromatography/Mass Spectroscopy for Plastics

Failure Analysis," which included examples of several types of failures solved by thermal desorption and pyrolytic GC/MS. We can supply the titles of oral and poster papers as well as abstracts of papers of interest. The full papers will be published in 2005 as a special issue of Elsevier, the publishers that organized the conference. The oral sessions included failure papers on mechanical products, pressure vessels, railways, structural, non-metallic components, pipelines, aerospace, automotive and power generation.

Pfizer Endows Distinguished Chair in Pharmacy

The School of Pharmacy has received a \$2 million gift from Pfizer Global Research and Development, a division of Pfizer Inc., to endow the school's first distinguished chair. It is the largest single gift ever received

by the school and the first such endowment Pfizer has made to a pharmacy program in the United States. More details can be found at <http://www.advance.uconn.edu/2004/040719/04071901.htm>.

Patrick Mather

Professor Patrick Mather will be leaving the University of Connecticut this fall and continuing his ca-

reer at Case Western Reserve University. We wish him well.

Retirements

Professor Norbert Greene retired after serving the Metallurgy and Materials Engineering Department for 34 years. An expert in the area of metal corrosion, Prof. Greene is best known as the co-author of one of the most popular textbooks, Corrosion Engineering.

Professor Maurice Gell, Professor-in-Residence, retired after 10 years of service to the Department.

Prof. Gell has been instrumental in initiating and sustaining research in the areas of coatings and nano-structured materials, and facilitating Departmental planning. Although formally retired, Prof. Gell will continue on a half-time basis, as previously, with all of his research student advisory and department responsibilities.

Martin J. Blackburn (1936 - 2004)

Martin J. Blackburn, 67, passed away on March 12, 2004 at Hartford Hospital after a long and courageous battle with cancer. Born in the United Kingdom, Dr. Blackburn obtained bachelor (1958) and doctorate (1962) degrees from the University of Cambridge in the United Kingdom. Subsequently he embarked upon a long and successful industrial and government career, of over 36 years, with the Boeing Company, the United States Air Force, and Pratt and Whitney. He retired from the position of Deputy Director of the Material and Process Laboratory at Pratt and Whitney in 2000. Post-retirement he joined the University of Connecticut as a Research Professor of Metallurgy and Materials Engineering in the Institute of Materials Science. Dr. Blackburn's early technical contributions included the definition of phase transformations in titanium systems. He led the initial development of titanium aluminides and invented nearly all of the first generation alloys; the

crystallographic orientation between the alpha two and gamma phases is often referred to as the "Blackburn Relationship." Dr. Blackburn was an author of over 50 publications and held seven patents. In 2002 he was honored to receive the William Hunt Eisenman Award from ASM International, which recognizes unusual achievements in industry in the practical application of materials science and engineering through production or engineering use. Dr. Blackburn was cited "for contributions to the science and engineering of materials used in gas turbine engines, especially the introduction of advanced titanium and superalloys." He was a member of ASM since June 1985. Dr. Blackburn is survived by his wife of 43 years, Janette; a daughter, Lisa, and son-in-law, Kostas, of Washington, DC; a son, Paul of Hartford; his two brothers, Graham Blackburn and Roland Blackburn and their wives, Josephine and Susan, of the United Kingdom; and several nieces and nephews.

Fall Semester Starts

Fall semester classes start Monday, August 30, 2004. Some courses that may be of interest include the following.

CHEM-380	Polymer Synthesis	A. Asandei
CHEM-381	Polymer Physical Chemistry	A. Dobrynin
CHEM-382	Polymer Characterization I	C. Sung
CHEG-351	Polymer Physics	M. Utz
CHEG-355	Morphology	L. Zhu
MMAT-301	Thermodynamics of Materials	H. Brody
MMAT-317	Electronic and Magnetic Properties of Materials	P. Alpay
MMAT-320	Welding	T. Kattamis
MMAT-322	Microscopic Investigation of Materials	M. Aindow

Membership Fee Changes

Some time ago a careful and detailed review of all of the finances associated with the IMS Associates Program revealed that the Program was not adequately recovering its true expenditures. After much thought, review, input from members, and discussion with the IMS external advisory board (many of whom are representatives of Associates Program members) the following changes in fee structure are being implemented.

Beginning January 1, 2004 all new Connecticut companies with more than 250 employees joining the Program are charged an annual fee of \$25,000. Starting July 2004 all existing in-state members will be offered continuing membership for one year at \$20,000 if they pay in full within 30 days of their renewal date. Beyond this grace period, renewal will be at a rate of \$25,000.

This year (again beginning July 2004) existing out-of-state members will be handled exactly the same, i.e., given an option of staying at \$20,000 per year, for one year, if they pay in full within 30 days of their renewal

date. In July of 2005 the annual membership fee for out-of-state companies will increase to \$30,000 per year. Again, for the year starting July 2005, all existing out-of-state member companies will be able to delay this increase by paying \$25,000 within 30 days of their renewal date.

Starting January 2004 all new out-of-state members are charged an annual fee of \$30,000 per year.

Finally, for existing small (less than 250 employees) in-state members, the annual fee will be increased in a fashion similar to that of the large in-state members but details will vary depending on the size of the company. As with large companies, new in-state small company members have been charged the new rates since January 2004.

We hope you understand the necessity of these changes and look forward to continuing to serve our members in the future.

Associates Program Annual Meeting

The Associates Program annual meeting was held on Wednesday May 26. Forty-four representatives from member companies joined IMS faculty, staff and students for the day's events. Titles and authors of presentations at the event follow.

"Contact-Damage-Resistant Ceramics and Composites"

Nitin Padture, Professor and Interim Department Head of Metallurgy & Materials Engineering

"Microstructural Development in Aerospace Alloys"

Mark Aindow, Associate Professor, Department of Metallurgy & Materials Engineering

"Structure and Morphology of Crystalline Polymer/Clay Nanocomposites"

Lei Zhu, Assistant Professor of Chemical Engineering

"Using Rheology to Examine the Structure of Complex Materials"

Montgomery Shaw, Distinguished Professor of Chemical Engineering

"Synthesis and Characterization of Nanostructured Materials"

Thomas Seery, Associate Professor of Chemistry

"Status of the IMS Associates Program"

Myer Ezrin, Director of the IMS Associates Program

"Carbon Nanotubes for Biosensory Technologies"

Fotios Papdimitrakopoulos, Associate Professor of Chemistry

IMS Talent Show

Thanks primarily to the efforts of Kim Post, July 16 saw the third IMS talent show/picnic held on the plaza outside IMS. Spirits were high and a good time was had by all. We close this issue of the newsletter with a few images from the event. Thanks to Jack Gromek for the pictures.



Master of Ceremonies, Tom Seery, entertains (?) us with a few jokes (?).



Jeff Tacy and Dan Goberman regale us with a song.

IMS Talent Show (cont.)



Brandon Berke: The Next Jimi Hendrix?



Pat Mather's Farewell Tour.



Cheryl Campo leaves them asking for more.



Burc Misirlioglu entertains us with his drawings and stories.



Kristen McBreairty gives us her rendition of Amazing Grace.

Polymer Program Poster Session May 21, 2004

Author(s)**Title****Advisor: A. Asandei**

Chen, Yanhui	Ti (III) Catalyzed Living Radical Polymerization of Styrene Initiated by Aldehydes
Moran, Issac	Towards Controlled Radical Polymerization of α , β , β -Trifluorostyrene
Saha, Gobinda	Ti (III) Catalyzed Self Condensing Vinyl Polymerization of Glycidyl Methacrylate

Advisor: A. Dobrynin

Jeon, Junhwan	Polymer Confinement and Bacterial Motility
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Advisor: P.T. Mather

Campo, Cheryl	Semicrystalline-Amorphous Blends of Poly(Vinylidene fluoride): Characterizing Shape Memory Behavior
Ge, Qing	Synthesis and Characterization of Biodegradable Shape Memory Polymer
Liu, Changdeng	High Thermal Conductivity Shape Memory Polymer
Marsh, Timothy	Hyperbranched Polymers for High Performance Applications
Patel, Pritesh	Polyelectrolyte Spin- Assembly: Effect of Ionic Strength & Spinning Rate on the Growth of Multilayered Thin Films
Qin, Haihu	Liquid Crystalline Thermosets as 2-Stage Shape Memory Materials
Rousseau, Ingrid	New Shape Memory Materials: Smectic Liquid Crystalline Elastomers
Wu, Jian	Nematic-Isotropic Interface

Advisor: R.S. Parnas

Liu, Qiang & McDonnell, A.	Basalt Fiber Reinforced Composites
Patil, Yatin & Simonlidis, S.	Interfacial Characterization of Nanocomposites by Fluorescence Spectroscopy
Ye, Peng (w/ D. Woerdeman)	Imaging Study of Electrospun Plant Protein Fiber

Advisor: F. Papadimitrakopoulos

Ju, Sang-Yong	NMR Study of Organization of N-Alkyl Chain Along the Sidewall of Singlewall Carbon Nanotubes (SWNTs)
Kim, Sang Nyon	Bulk Separation of Semiconducting Singlewall Carbon Nanotubes as a Function of Surfactant Chain Length
Kim, Sejong	Quantitative Analysis on DNA - Grafting Densities for the Assembly of 2-D Opaline Arrays
Lee, Jeunghoon	Structural Dynamics Characterization of Poly (Allyl Amine) Encapsulated CdSe Nanocrystals
Li, Rongfu	SWNT Templated Alignment of CdSe Quantum Rods
Luo, Zhengtang	Characterization of Individual SWNT Suspension and Diameter Selective Separation of Semiconducting SWNT
Mathai, Mathew	Efficient Long-lives Alq3 Based OLEDs via Hole-current Modulation
Tipnis, Ritesh	Self-Assembled Membranes Based on Humic Acids for Controlled Detection of Glucose in Implantable Biosensors

Advisor: T.A. P. Seery

Guino, Rosetter & Lagadic, Isabelle Polymer Nanocomposites from Silica Nanowafers
 De Mesa, Maricel Anomalous Dynamic Light Scattering from Polymer Mixtures in a Light Absorbing Medium

Advisor: M.T. Shaw

Boob, Smita Electric -Field-Structured Proton Exchange Membranes
 Gasas, Jeffery Conductivity Enhancement of Ion-containing Polymer Blends Using Electric Field Structuring Techniques
 Gupton, Jonathan SPS/ PPO Blends
 Liu, Vincent Phase Behavior and Rheology of PEP/SEP/ Squalane Ternary Systems
 Patil, Yatin In-situ Water Content Determination in Fuel Cell by Fluorescence Steoroscopy
 Kothapalli, Chandra Biodegradable HA-PLA Composites Prepared by Solvent Cast-Salt Leaching Method (co-adv: M. Wei)
 Senador, Tony Understanding Asphalt
 Swier, Steven Design of Polymer Blends for Proton -Exchange Membrane Materials (co-Adv: R.A. Weiss)

Advisor: G.A. Sotzing

Lee, Byoungchul Water Processable, Low Band Gap Ring Sulfonated Polythiophene (SpOT)
 Jang, Sung-Yeon Direct Writing of Poly(terthiophene) Nanowires using Electrochemical Oxidative Nanolithography (ECON)
 Seshadri, Venkataramanon Low Band Gap Poly(Thieno[3,4 -b]thiophenes) Containing Cyanovinylene Spacers

Advisor: C.S.P. Sung

Xu, Dapeng Water Characterization of Nylon 6

Advisor: M. Utz

Nandagopal, Magesh Characterization of Organic Light-Emitting Materials Using Solid State NMR (w/ M. Mathai & F. Papadim)

Advisor: R.A. Weiss

Bhiwankar, Nikhil Melt Intercalating Pristine Montmorillonite Using Amine Neutralised Ionomers
 Kim, Byeongyeol & Fishman, Dani Nanocomposites Derived from Melt Mixing a Thermotropic Liquid Crystalline Polyester and Zinc Sulfonated Polystyrene Ionomers
 Liu, Mojun & Shang, S (co-adv: Huang) Copolymer Based on Itaconic and Lactic Acids
 Tian, Jun Microstructure of Hydrophobically Modified Alkyl Acrylamides
 Wang, Yanbing Preparation of Conductive Foams and their Application as Chemical Sensors (co-adv: G. Sotzing)
 Wu, Qi Properties of Poly (styrene-co-vinyl phosphate) Ionomers
 Zhai, Xiaowen Dewetting Behavior of Random Sulfonated Polystyrene Ionomers on a Silica Surface
 Zhao, Hongying Rheology Properties of Sulfonated Polystyrene Ionomers

Advisor: L. Zhu

Liu, Yuxiu Immobilization of PTA in Nafion® Membranes and their Application in High Temperature Fuel Cell
 Miao, Jianjun Forced Polymer Chain Folding in Amphiphilic Unimolecular Micelles
 Sun, Lu Two-Step De-intercalation and Intercalation Induced by Polymer Crystallization and Melting in Poly(ethylene oxide)/Organoc lay Nanocomposites

IMS Associates Program

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We're on the Web!
www.ims.uconn.edu/assoc

Department Seminars

Fall Seminar schedules have not been finalized at this time. We will send the schedules to our members for the Metallurgy and Materials Engineering Department and the Polymer Program when finalized. This information, and the seminar schedules for most departments, will also be available on the World Wide Web. Abstracts of seminars are usually available about a week in advance. We can also put you in touch with the faculty member sponsoring the seminar to learn more about the specific seminar of interest. We suggest you call before attending to be sure the seminar has not been canceled due to illness or weather.

IMS Short Courses

This summer the IMS Associates Program offered one short course; Plastics Failure: Cause and Prevention presented by Dr. Ezrin (Director of the IMS Associate Program and Research Scientist). His book, "Plastics Failure Guide - Cause and Prevention," was used. Demonstrations were given of environmental stress cracking of polycarbonate by acetone, which caused instantaneous fracture and of optical birefringence of internal stress in injection molded parts.

Plans for next summer's short courses are still in development. We welcome your suggestions.

Sample Preparation

In many projects that the Associates Program deals with, such as adhesion and coatings, surface analysis techniques are extremely important. The techniques used for such analysis, particularly GC/MS, Auger electron spectroscopy (AES) and x-ray photoelectron spectroscopy (XPS) are extremely sensitive to small amounts of material on the surface. It is important to make efforts not to contaminate these surfaces during sample preparation, collection and shipment. **Shipment in common plastic bags should be avoided!** Common plastic bags typically contain significant amounts of additives used to prevent the plastics from adhering to themselves and other materials. These additives will migrate to the

sample during shipment and at best make interpretation difficult and sometimes impossible. It is much better to ship such samples in common kitchen aluminum foil (not industrial aluminum foil which is often coated with an oil or other release agent). Samples can also be shipped in glass containers with aluminum foil over the opening under the cap.

Alternatively special polyester bags that do not contain such additives can be purchased. One source of such bags is the Kapak Corporation, 5305 Parkdale Drive, Minneapolis, MN.