

MATERIALS SCIENCE AND TECHNOLOGY NEWSLETTER

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Dr. Robert H. Lacombe
Chairman
Materials Science and Technology
CONFERENCES, LLC
3 Hammer Drive
Hopewell Junction, NY 12533-6124
Tel. 845-897-1654, 845-227-7026
FAX 212-656-1016
E-mail: rhlacombe@compuserve.com

SURFACE SCIENCE ASPECTS OF PHARMACEUTICAL TECHNOLOGY AND CONTACT ANGLE

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EDITORIAL COMMENTS

This issue of the newsletter announces the preliminary programs for two upcoming MST symposia of great interest to both surface scientists and those in the biotechnology area, especially those engaged in problems of drug delivery and pharmacology. The first symposium:

INTERNATIONAL SYMPOSIUM ON SURFACE SCIENCE ASPECTS OF PHARMACEUTICAL SCIENCE, PHARMACOLOGY, COSMETICS AND BIOTECHNOLOGY, To be held April 19-21, 2010, Danbury Connecticut, USA.

will deal with all aspects of pharmacology and biotechnology which are critically dependent on understanding the nature of surface interactions which control the behavior and biological activity of therapeutical formulations as well as biomedical technologies such as bio-adhesives, drug delivery systems, cosmetic formulations and gene chip arrays.

The second symposium:

SEVENTH INTERNATIONAL SYMPOSIUM ON CONTACT ANGLE, WETTABILITY AND ADHESION; To be held June 23-25, 2010, Danbury Connecticut, USA

will be concerned with both the fundamental and applied aspects of contact angle measurements. Issues such as the applicability and validity of various measurement techniques and the proper theoretical framework for the analysis of contact angle data.

The conference director Dr. Mittal and I cordially invite all readers of the Newsletter to join us in Danbury for either or both of these symposia. Details of the preliminary programs are given in what follows including detailed hotel and registration information.

INTERNATIONAL SYMPOSIUM ON SURFACE SCIENCE ASPECTS OF PHARMACEUTICAL SCIENCE, PHARMACOLOGY, COSMETICS AND BIO-TECHNOLOGY ; April 19-21, 2010 in Danbury, Connecticut, USA

The overall focus of the symposium will of necessity be multi-disciplinary in nature involving researchers engaged in developing new drugs as well as surface scientists concerned with the detailed nature of surface interactions and their accurate measurement. It is indeed a prime objective of the symposium to bring these normally disparate groups together within a forum where needs, ideas and methodologies can be discussed and mutually

beneficial collaborations encouraged.

It is well recognized that a wide range of critical biological interactions occur at or across surfaces including drug absorption, cellular adhesion, autoimmune reactions, skin inflammation and cell growth to name a few. Thus in order to control or modify these processes it is first critical to understand the fundamental nature of the surface interactions which control them. It is at this level that the surface scientist and the bio-technologist can collaborate to develop innovative technologies for drug delivery, cellular and bone repair, cosmetic formulations and advanced diagnostic methods such as gene chip arrays.

A further focus of the program is to highlight the multidisciplinary nature of the overall problem of understanding the surface interactions which govern a wide array of biological processes. On the one hand, the pharmaceutical scientists and bio-technologists can elucidate the problems and methods of their disciplines with regard to issues relating to delivery and adsorption of drug metabolites, interactions leading to inflammation or implant rejection and adverse immune system response to medical treatments. The surface scientist, on the other hand, can demonstrate how the methods of surface analysis and measurement can be brought to bear on the problem of understanding the basic surface chemistry which controls these processes. As an example, the bio-technologist might explain the problems associated with a topical skin treatment whereas the surface scientist can demonstrate how contact angle measurements can be used to evaluate the wettability characteristics of skin and how this affects the absorption of and reaction with topical medications.

SYMPOSIUM TOPICS:

Needs of the Biomedical, Pharmaceutical and Cosmetic industries:

1. Interaction of biologically active molecules with tissue substrates.
2. Problems of drug delivery in vivo
3. Drug interactions with cellular surfaces relating to immune system response and implant rejection
4. Interactions with biomaterial surfaces
5. Biocompatibility
6. Problems relating to drug encapsulation in capsules or tablets
7. Skin surface chemistry and interactions

Tools and Methodologies of Surface Science:

1. Surface analytical methods
 - a. ESCA, AUGER, SIMS ...
 - b. Atomic Force Microscopy
 - c. Contact Angle Goniometry
 - d. Surface Micro-Calorimetry
2. Theoretical concepts of Surface Science
 - a. Hamaker theory
 - b. JKR theory
 - c. Surface thermodynamics
 - d. Acid-Base interactions
3. Surface Chemistry Modification
 - a. Silane adhesion promoters
 - b. Chemical grafting
 - c. Plasma and radiation modification

Applications:

1. Drug Delivery Systems
 - a. Delivery through fabrics made with surface modified fibers
 - b. Advanced capsule and tablet technologies
 - c. Delivery using surface activated particles
 - d. Drug screening, label free detection
2. Advanced adhesives for mending bone fractures
3. Gene chip arrays
4. Immobilization strategies of biomolecules on solid surfaces
5. Cosmetic applications

Cross-Disciplinary Studies:

1. Use of Atomic Force Microscopy to study biological surfaces
2. Contact angle measurements on skin and dental tissues
3. Bioadhesives such as hydrogels
4. Advanced adhesive applications employing the GECKO effect
5. Applications of superhydrophobicity and the LOTUS LEAF effect
6. Micro/Nano Technology; e.g. smart implants using MEMS

PRELIMINARY PROGRAM

BIOLOGICAL SURFACE PROPERTIES AND CELL ADHESION

Thomas Ballet, Laurence Boulangé, Yves Bréchet, **Franz Bruckert**, Paolo Mangiagalli, Laurent Nault, Marianne Weidenhaupt; **Kinetics of Insulin Amyloid Fiber Formation on Hydrophobic Surfaces**

Peilin Chen; Research Center for Applied Sciences, Academia Sinica, Nankang, Taipei 115, TAIWAN; **Observation of Enhanced Cell Adhesion and Transfection Efficiency on the Superhydrophobic Surfaces**

K. Fricke, K. Schröder, T. v. Woedtke and K.-D. Weltmann; Leibniz Institute for Plasma Science and Technology (INP), Felix-Hausdorff-Strasse 2, 17489 Greifswald, GERMANY; **Atmospheric Pressure Plasma Sources - Modification and Decontamination of Biomedical Relevant Surfaces**

Cláudia Sousa; IBB-Institute for Biotechnology and Bioengineering Centre of Biological Engineering, University of Minho, Campus de Gualtar 4710-057 Braga, PORTUGAL; **Thermodynamic Analysis of S. Epidermidis Adhesion to Biomedical Materials**

SURFACE SCIENCE ASPECTS OF DRUG DELIVERY

Xiaoping Cao; Pfizer Global Research & Development, Eastern Point Road, Groton, CT 06340; **Characterizing Surface Properties of Pharmaceutical Materials Using Atomic Force Microscopy**

Arthur J. Coury; 154 Warren Avenue, Boston, Massachusetts 02116; **Local Drug Delivery from Synthetic Hydrogel Implants**

Mitsuhiro Ebara, Takao Aoyagi, Masayuki Yamato and Teruo Okano; Biomaterials Center, National Institute for Materials Science, JAPAN; **Switchable Surface Capture/ Release Systems For Cells, Biomolecules, And Analytical Beads**

F.J. Chen, Tommasina Bramante, Richard Deanne, George Gereg, Svetlana Sienkiewicz, Luying Wang and **Frank M. Etzler**; Pharmaceutical R&D, Boehringer-Ingelheim Pharmaceuticals, Inc. POB 368, 900 Ridgebury Road, Ridgefield, CT 06877; **Effect of Sodium Dodecyl Sulfate on the Tabletability, Compressibility and Compactibility of Common Pharmaceutical Excipients.**

G. Papandreou, K. Wolf, J. Meng, N. Rahbar, **C. A. Maryanoff**, and W. Soboyejo; Convergent Product Development, Cordis Corporation, Welsh and McKean Roads, Spring House, PA 19477; **Durability Studies of Drug-Eluting Stents**

K. Schröder, B. Finke, K. Fricke, U. Menyes, A. Ohl, T. Vorhaben, D. Böttcher, U. T. Bornscheuer and K.-D. Weltmann; Leibniz Institute for Plasma Science and Technology (INP), Felix-Hausdorff-Strasse 2, 17489 Greifswald, Germany; **Plasma-assisted Immobilization of Bioactive Molecules for Biomedical and Biotechnological Applications**

Jean-Sébastien Samson, Hilton Barbosa de Aguiar, Alex de Beer and **Sylvie Roke**; Max-Planck Institute for Metals Research, Stuttgart, GERMANY; **Structure and Functionality of a Potential Liver Cancer Medicine**

Sofia Svedhem; Rickard Frost, and Bengt Kasemo; Dept. of Applied Physics, Chalmers University of Technology, 412 96 Göteborg, SWEDEN; **Supported Lipid Membranes as Model Systems for Nanodrug and Nanoparticle Interactions at Biological Barriers**

ANALYTICAL MEASUREMENTS ON BIOLOGICAL SURFACES

Matthias Lauer; F.Hoffmann La-Roche LTd., Pharmaceutical Research, Basel 4070, SWITZERLAND; **Screening Assay to Probe API/Exipient Melt Miscibility and Stabilities using Scanning Probe Microscopy**

Thomas Luxbacher; Anton Paar GmbH, Anton-Paar-Strasse 20, A-8054 Graz, AUSTRIA; **Assessment of Biomaterial Surfaces by Streaming Potential Measurement**

Saurabh Mittra and Robert E. Baier; CPF (Pepsi) & NEHF (Lipton) Inc, 25 Copeland Drive, Ayer, MA 01432 ; **Infrared Microscopic Monitoring of Microfouling on Germanium Surfaces**

Mark Poggi; Biolin Scientific, 808 Landmark Drive Suite 124, Glen Burnie, MD 21061; **Enabling in vitro Real-Time Characterization of Biointerfaces with Quartz Crystal Microbalance with Dissipation Monitoring**

Nicholas Randall; CSM Instruments, Needham MA; **State-of-the-art in Surface Mechanical Properties Characterization of Biomaterials**

Xu Li, Junfei Tian and **Wei Shen**; Australian Pulp and Paper Institute, Department of Chemical Engineering, Monash University, Clayton Campus, VIC 3800 AUSTRALIA; **Thread-based Low-cost Semi-quantitative Diagnostic Sensors**

INVESTIGATIONS OF BIOLOGICAL CRYSTALS AND LIQUID STATE

J. Y. Y. Heng; Imperial College London, South Kensington Campus, London SW7 2AZ; **Geometrical and Chemical Interactions for Controlled Nucleation and Crystallization of Lysozyme**

Hilton Barbosa de Aguiar, Alex de Beer, Matthew L. Strader and **Sylvie Roke**; Max-Planck Institute for Metals Research, Stuttgart, Germany; **SDS Surfactant Has a Marginal Effect on the Interfacial Tension of Nanoscopic Oil Droplets in Water**

Carel Jan van Oss; School of Medicine and Biomedical Sciences, SUNY Buffalo, Buffalo, NY 14214-3078; **Anisotropy of Air-dried Polar Solids and of Aqueous Solutions of Polar Solutes Part I: Anisotropy of Polar Solids Caused by the Air-drying of Aqueous Solutions and its Relation to the Solubility Equation**

Carel Jan van Oss; School of Medicine and Biomedical Sciences, SUNY Buffalo, Buffalo, NY 14214-3078; **Anisotropy of Air-dried Polar Solids and of Aqueous Solutions of Polar Solutes Part II: Anisotropy of Aqueous Solutions of Polar Solids with Respect to the Water-Air Interface**

SEVENTH INTERNATIONAL SYMPOSIUM ON CONTACT ANGLE, WETTABILITY AND ADHESION To be held in Danbury, Connecticut USA, June 23-25, 2010

In his opening remarks at the first symposium in this series Professor Robert Good pointed out that Galileo in the 17th century was quite likely the first investigator to observe contact angle behavior with his experiment of floating a thin gold leaf on top of a water surface. Since that time contact angle measurements have found wide application as a method for determining the energetics of surfaces. This, in turn, has a profound effect on the wettability and adhesion of liquids and coatings to surfaces.

This symposium will be concerned with both the fundamental and applied aspects of contact angle measurements. Issues such as the applicability and validity of various measurement techniques and the proper theoretical framework for the

analysis of contact angle data.

In addition, a host of applications of the contact angle technique will be explored including but not limited to: wettability of powders, fibers, wood products, papers, polymers and monolayers. Further focus will be on the use of contact angle data in evaluating surface modification procedures, determining relevance of wettability to adhesion, the role of wettability in bioadhesion, ophthalmology, prosthesis and in the control of dust in mining and milling applications. The primary focus of this symposium will be to provide a forum for the discussion of cutting edge advancements in the field and to review and consolidate the accomplishments which have been achieved thus far.

SYMPOSIUM TOPICS:

Factors Influencing Contact Angle Measurements:

- ◆ Static and dynamic contact angles, effect of surface flaws and surface roughness on wetting.
- ◆ Effect of pore size distribution
- ◆ Effects of velocity and viscosity of liquid on solid-liquid interfacial behavior.
- ◆ Interaction forces including: van der Waals, Acid-Base, Hydrogen bonding, ...etc

Wettability Behavior and Surface Characterization of Various Materials:

- ◆ Contact angle interpretation and hysteresis.
- ◆ Wettability of various material surfaces including but not limited to: wood, elastomers, silicon wafers, pharmaceutical powders, metals, polymers, paper, particles, fibers... etc.
- ◆ Surface treatments to modify wettability behavior.
- ◆ Superhydrophobicity

Wettability, Adhesion and Applied Aspects of Contact Angle Measurements:

- ◆ Effect of surface energetics on adhesion.
- ◆ Biological applications including protein and bacterial adhesion.
- ◆ Fine particle adhesion and control of dust.
- ◆ Other technological applications including: printing, agriculture, pharmaceuticals, textiles and paper.

PRELIMINARY PROGRAM

MEASUREMENT METHODS

S. F. Chini and **A. Amirfazli**; Department of Mechanical Engineering, University of Alberta, Edmonton, AB, CANADA T6G 2G8; **A New Method for Measuring the Contact Angle of Asymmetric and Symmetric Drops**

Andrew J. B. Milne and **Alidad Amirfazli**; Department of Mechanical Engineering, University of Alberta, Edmonton, AB, CANADA; **Drop Adhesion to Surfaces Exposed to a Shearing Airflow**

Thomas Bahners; Deutsches Textilforschungszentrum Nord-West e. V., Institut an der Universität Duisburg-Essen Adlerstraße 1, 47798 Krefeld, GERMANY; **The "Do's" and "Donts" of Wettability Characterization in Textiles**

Javier Montes Ruiz-Cabello, Felipe II Guerrero-Barba, Miguel A. Rodríguez-Valverde and **Miguel A. Cabrerizo-Vílchez**; Biocolloid and Fluid Physics Group, Department of Applied Physics, University of Granada, Granada SPAIN; **A New Strategy to Predict the Equilibrium Contact Angle of Rough Homogeneous Surfaces from Contact Angle Hysteresis Measurements**

Shreerang S. Chhatre, Jesus O. Guardado, Joseph M. Mabry, Gareth H. McKinley, and Robert E. Cohen; Department of Chemical Engineering Massachusetts Institute of Technology, Cambridge, MA 02139; **Girifalco – Good Analysis on Perfluorinated SiO_x Surfaces**

SUPERHYDROPHOBIC EFFECT

Wei Xu, Rajesh Leeladhar, and **Chang-Hwan Choi**; Department of Mechanical Engineering, Stevens Institute of Technology, Hoboken NJ; **Effects of Micro and Nano Particles on Wetting Dynamics of Evaporating Droplets on Superhydrophobic Surfaces**

Lutz Prager, Thomas Bahners; Leibniz-Institut für Oberflächenmodifizierung,; **Creating Superhydrophilic Surfaces by Photo-induced Microfolding**

Jonathan Rothstein; Mechanical and Industrial Engineering, University of Massachusetts, Amherst, MA 01003; **Drag Reduction Using Superhydrophobic Surfaces**

Tamir Stein; Ariel University Center of Samaria, Department of Chemical Engineering and Materials. Bar-Ilan University, Chemistry Department; **Electrostatically Driven Droplets Deposited on Superhydrophobic Surfaces**

CONTACT ANGLE FOR SURFACE CHARACTERIZATION

Y.L. Chow, C.K. Chan and C.W. Kan; Institute of Textile and Clothing, The Hong Kong Polytechnic University, Hung Hom, Kowloon, HONG KONG; **A Study of Grey Cotton Fabric Using Laser Technology and Contact Angle Goniometry**

Y.L. Lam, C.W. Kan, C.W.M. Yuen and C.H. Chui; Institute of Textiles and Clothing, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, CHINA; **Surface Physical and Chemical Analysis of Plasma-treated Cotton Fabric Subjected to Wrinkle-resistant Finishing**

Marko Petrič and Milan Šernek; University of Ljubljana, Biotechnical Faculty, Department of Wood Science & Technology, amnikarjeva 101, SI-1000 Ljubljana, SLOVENIA; **Contact Angle Measurements on Wood And Calculation of Its Surface Free Energy**

P.G. Rouxhet, M.J. Genet, J. Landoulsi, S. Fleith, S. Derclaye, Y. Adriaensen; Unité de chimie des interfaces, UCLouvain, Croix du Sud 2/18, B-1348 Louvain-la-Neuve, BELGIUM; **How clean is a cleaned surface ?**

Carmen L. Moraila-Martínez, Ramón Pericet-Cámara, **Miguel A. Rodríguez-Valverde** and Miguel A. Cabrerizo-Vílchez; Biocolloid and Fluid Physics Group, Department of Applied Physics, University of Granada, Granada SPAIN; **Kinetic Contact Angle Hysteresis of Titanium Surfaces**

CONTACT ANGLE FOR ADVANCED MATERIALS DEVELOPMENT

Yu Fu and W. H. Zhong; School of Mechanical and Materials Engineering, Washington State University, Pullman, WA 99164; **Effects of Nano-additives on Dynamic Wetting Behavior and Flowability of Epoxy Resins**

Adam J. Meuler, Kyoo-Chul (Kenneth) Park, Joseph M. Mabry, Gareth H. McKinley, and Robert E. Cohen; Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139; **Towards Practical Omniphobic Coatings**

G.C. Pirlot, O. Debaisieux, A. Goedel, A. Lacroix, B. Nysten, **P.G. Rouxhet**; Unité de chimie des interfaces, UCLouvain, B-1348 Louvain-la-Neuve, BELGIUM; **Surface Modification of Bi-oriented Polypropylene Films Used for Food Packaging**

Andreas Wego and Thomas Banners; Deutsches Textilforschungszentrum Nord-West e.V.; **Photochemical Functionalization of Carbon Fibers for Enhanced Matrix Adhesion**

ADVANCED INVESTIGATIONS

Edward Bormashenko; Ariel University Center of Samaria, Applied Physics Faculty, Ariel, Israel, 40700, P.O.B. 3; **Novel Investigations of Liquid Marbles**

Augustin Karasangabo and Bernhard Christian; University of Leoben, Franz-Josef-Straße 18, A-8700 Leoben, AUSTRIA; **Investigation of the Nature of Liquid Steel – Alumina Interfacial Interactions from Sessile Drop Measurements: Cases of Fe-Ti and Fe-P Alloys**

L. Mazzola, M. Sebastiani, R. Scandurra and F. Carassiti; Mechanical and Industrial Engineering Department, University "Roma Tre", Rome, ITALY; **Influence of Ion Beam Surface Litography on Wettability and Surface Free Energy of Biocompatible Polymeric Surface**

Kyoo-Chul (Kenneth) Park, Shreerang S. Chhatre, Wonjae Choi, Robert E. Cohen, and Gareth H. McKinley; Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139; **Robustness Analysis of Non-Wetting Surfaces Based on Distorted Liquid-Air Interfaces of Droplets**

J. R. Moffat, K. Sefiane and **M. E. R. Shanahan**; Laboratoire de Mécanique Physique (LMP)-UMR CNRS 5469, Université Bordeaux 1, 351 Cours de la Libération, 33405 TALENCE Cedex, FRANCE; **Wetting Hysteresis as Induced by Liquid Nano Suspensions**

Rafael Tadmor, Prashant Bahadur, Aisha Leh, Hartmann E. N'guessan, Rajiv Jaini, Lan Dang and Dan F. Smith Department of Chemical Engineering, Lamar University, Beaumont TX 77710; **The Influence of Normal Force on the Lateral Force at the Interface Between a Liquid Drop and a Surface**

REGISTRATION, HOTEL AND TRAVEL INFORMATION

APRIL 19-21, 2010: INTERNATIONAL SYMPOSIUM ON SURFACE SCIENCE ASPECTS OF PHARMACEUTICAL SCIENCE, PHARMACOLOGY, COSMETICS AND BIOTECHNOLOGY

www.mstconf.com/SurfSciPharm.htm

JUNE 23-25, 2010: SEVENTH INTERNATIONAL SYMPOSIUM ON CONTACT ANGLE, WETTABILITY AND ADHESION

www.mstconf.com/contact7.htm

LOCATION:

DANBURY PLAZA
Hotel & Conference Center
18 Old Ridgebury Road
Danbury, CT 06810
Tel. 203-794-0600
FAX. 203-798-7735

E-mail: aweber@danburyplaza.com

Web Site: www.danburyplaza.com

HOTEL:

Please make room reservations directly with the Danbury Plaza Hotel. A block of rooms has been set aside for conference registrants until March 15, 2010. After this date the hotel will accept reservations on a space available basis and they cannot guarantee that the special conference rate of \$99/night will apply. Make your reservations early and be sure to mention that you are attending the MST symposium in order to receive the reduced conference hotel rate.

TRANSPORTATION:

Limousine and shuttle service is available from Laguardia and Kennedy airports

SHORT COURSE ON APPLIED ADHESION MEASUREMENT METHODS, April 22 or JUNE 26, 2010:

Associated with these symposia MST gives a short course on adhesion measurement methods. Since nearly all of the MST symposia have some relation to adhesion phenomena, the ability to quantify the adhesion of one material layer to another is clearly one of the unifying themes. This course is designed to mesh with the topical symposia by presenting an overview of the most useful adhesion measurement techniques which are being used to evaluate the **PRACTICAL ADHESION** of coatings. Emphasis will be given to methods which can be carried out in a manufacturing environment as well as in the lab

and which give results that are directly relevant to the durability and performance of the coatings. The effects of material elastic properties and residual stress are considered as well as other external influences which affect coating adhesion.

Audience: Scientists and professional staff in R&D, manufacturing, processing, quality control/reliability involved with adhesion aspects of coatings or laminate structures.

Level: Beginner to Intermediate

Prerequisites: Elementary background In chemistry, physics or materials science.

Duration: 1 day

Registration fee: \$595: Includes course notes, handouts and a copy of the newly published [handbook and reference volume: ADHESION MEASUREMENT METHODS: THEORY AND PRACTICE](#) (CRC Press, 2006).

How You Will Benefit From This Course:

- ▶ **Understand advantages and disadvantages** of a range of adhesion measurement techniques.
- ▶ **Gain insight** into mechanics of adhesion testing and the role of intrinsic stress and material properties
- ▶ **Learn optimal methods** for setting adhesion strength requirements for coating applications.
- ▶ **Learn how to select** the best measurement technique for a given application.
- ▶ **Gain perspective** from detailed discussion of actual case studies of product manufacturing and development problems.

These symposium is being organized under the direction of Dr. K. L. Mittal, Editor-in-Chief, Journal of Adhesion Science and Technology and by MST Conferences. All presenters will be invited to publish their work in the Journal of Adhesion Science and Technology. Please notify the conference chairman of your intentions to present a paper as early as possible. An abstract of about 200 words should be sent to the conference chairman by **March 30, 2010** for the April 19th symposium and by **April 15, 2010** for the June 21 symposium by any of the following methods:

E-mail: rhlacombe@compuserve.com

FAX: 212-656-1016

Regular mail:

Dr. Robert H. Lacombe
Conference Chairman
3 Hammer Drive
Hopewell Junction, NY 12533

Contact by phone: 845-897-1654; 845-227-7026
Full conference details and registration via the
Internet will be maintained on our web site:

CANCELLATIONS: Registration fees are refundable, subject to a 15% service charge, if cancellation is made by March 15, 2010 or May 15, 2010 for the respective symposia. **NO** refunds will be given after these dates. All cancellations must be in writing.

Substitutions from the same organization may be made at any time without penalty. MST Conferences reserves the right to cancel any of the symposia or the short course if it deems this necessary and will, in such event, make a full refund of the registration fee. No liability is assumed by MST Conferences for changes in program content.

REGISTRATION FORM: CHECK ALL THAT YOU WANT TO ATTEND

INTERNATIONAL SYMPOSIUM ON SURFACE SCIENCE ASPECTS OF PHARMACEUTICAL TECHNOLOGY, April 19-21, 2010 (speaker/student)	\$395
INTERNATIONAL SYMPOSIUM ON SURFACE SCIENCE ASPECTS OF PHARMACEUTICAL TECHNOLOGY April 19-21, 2010 (regular attendee)	\$595
FIFTH INTERNATIONAL SYMPOSIUM ON CONTACT ANGLE, WETTABILITY AND ADHESION, JUNE 23-25, 2010 (speaker/student)	\$395
FIFTH INTERNATIONAL SYMPOSIUM ON CONTACT ANGLE, WETTABILITY AND ADHESION, JUNE 23-25, 2010 (regular attendee)	\$595
Sub Total	
Deduct additional 10% if more than 1 participant from same institution	
Short Course on Applied Adhesion Measurement Methods	\$595
TOTAL REGISTRATION FEE	

METHOD OF PAYMENT, CHECK WHICH METHOD YOU PREFER

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