

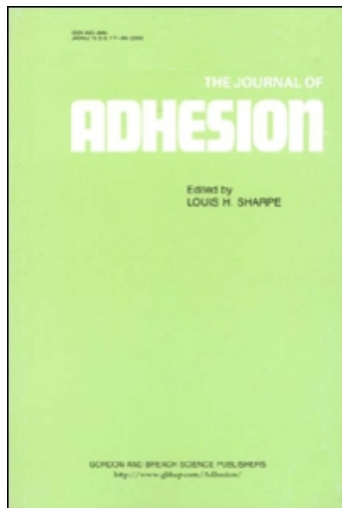
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## **The Seventeenth Annual Meeting of the Adhesion Society**

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# The Seventeenth Annual Meeting of the Adhesion Society

## PRELIMINARY PROGRAM

### MONDAY, FEBRUARY 21, 1994

#### SESSION A1

#### MECHANICS OF INTERFACES

*Session Chair: D. A. Dillard, VPI&SU*

- 8:00 - 8:10    Introductory Remarks
- 8:10 - 8:40    “Micromechanics of Fiber Pullout”—*K.-S. Kim*, Brown University, USA (Invited)
- 8:40 - 9:00    “Scale-Area Analysis and Roughness: A Method for Understanding the Topographic Component of Adhesive Strength” *C. A. Brown*, Worcester Polytechnic Institute, USA
- 9:00 - 9:20    “Metal/Ceramic Adhesion: Fracture Toughness of Ni/Al<sub>2</sub>O<sub>3</sub> Interfaces”—*A. T. Zehnder* and *M. E. Thurston*, Cornell University, USA
- 9:20 - 9:40    “A Cleavage Test for Mechanical Characterization of Adhesive Bonded Joints”—*P. O. Santacreu*, *V. De Greef* and *K. Dang Van*, Ecole Polytechnique-Palaiseau, FRANCE
- 9:40 - 10:00    “Accelerated Fracture Mechanics-Based Lifetime Forecasting Procedures for Time-Dependent Crack Growth at the Heat Fusion Interfaces of Polyethylene Joints”—*M. F. Kanninen*, Southwest Research Institute, *C. H. Popelar*, Ohio State University and *C. J. Kulhman*, Southwest Research Institute, USA
- 10:00 - 10:20    Break

**SESSION A2****BUCKLING DELAMINATION AND RESIDUAL STRESSES***Session Chair: D. A. Dillard, VPI&SU*

- 10:20 - 10:40 "Mechanics of Thin Layer Buckling and Interface Crack Growth"—  
B. Storåkers and A. É. Ginnakopoulos, Royal Institute of Technology,  
SWEDEN
- 10:40 - 11:00 "Buckles in Adhering Elastic Films and a Test Method for Adhesion  
Based on the Elastica"—*A. N. Gent*, University of Akron, USA
- 11:00 - 11:20 "Noncontact Determination of Viscoelastic, Thermal, and Adhesive  
Properties in Thin Film-Substrate Systems"—*J. A. Rogers* and *K. A.  
Nelson*, MIT, USA
- 11:20 - 11:40 "Some Aspects of Residual Stresses in Adhesive Joints"—*Y. Weits-  
man*, University of Tennessee and Oak Ridge National Laboratory,  
USA
- 11:40 - 12:00 "A Thermoviscoelastic Analysis of Residual Stresses in Adhesive Joints  
and Implications for Fracture and Bond Strength"—*C. Duong* and  
*W. G. Knauss*, California Institute of Technology, USA
- 12:00 - 1:30 Lunch

**SESSION A3****CHEMISTRY STUDIES***Session Chair: J Cercena, Norton Chemical*

- 1:30 - 1:50 "Adhesion Enhancement in Polystyrene/Polyethylene Blends by Corona  
Treatment and Polymeric Additives"—*M. Bousmina*, *P. Bataille*,  
*S. Sapiéha* and *H. P. Schreiber*, Ecole Polytechnique, CANADA
- 1:50 - 2:10 "Comparative Epoxy and Cyanate Resin Hydrogen Bonding and Fiber  
Interface Study"—*A. W. Snow* and *J. P. Armistead*, Naval Research  
Laboratory, USA
- 2:10 - 2:30 "Multi-Functional Vinyl Silicone for Addition Cured Silicone Pressure  
Sensitive Adhesives"—*S. B. Lin*, GE Silicones, USA
- 2:30 - 2:50 "Crystallization and Morphological Study of ICI's Intermediate Tem-  
perature Semicrystalline (ITX) Polymer"—*P. A. Percha* and *G. L.  
Wilkes*, VPI&SU, USA

2:50 - 3:10 "Use of In-Situ Cure Monitors to Produce Controlled Networks and Morphologies in a Toughened Thermoset: Physical and Mechanical Effects"—J. M. Cartwright, S. A. Srinivasan, A. C. Loos and T. C. Ward, NSF Science & Technology Center: VPI&SU, and D. E. Kranbeuhl, College of William and Mary, USA

3:10 - 3:30 Break

#### **SESSION A4**

##### **PARTICLE ADHESION**

*Session Chair: D. Rimai, Eastman Kodak*

3:30 - 3:50 "Particle-Substrate Collisions, Particle Entrainment and Hydrodynamic Removal"—A. Busnaina, Clarkson University, USA

3:50 - 4:10 "Mechanics of Particle Adhesion"—L. DeMejo and D. Rimai, Eastman Kodak Co., USA

4:10 - 4:30 "Electrostatic Detachment of Particles from Substrates"—D. Hays, Xerox Corporation, USA

4:30 - 4:50 "Effect of Humidity of Particle Adhesion"—T. Tombs, Eastman Kodak Co., USA

4:50 - 6:00 Break

6:00 - 7:30 **POSTER SESSION**

*Session Chair: TBD*

#### **SESSION B1**

##### **SURFACE TREATMENTS**

*Session Chair: J. G. Dillard, VPI&SU*

10:20 - 10:40 "Surface Pretreatments With Respect to Adhesive Bonded Repairs to Aircraft Structures"—J. R. Oosting, Delft University of Technology, NETHERLANDS

10:40 - 11:00 "Paint Adhesion Study of Polypropylene/EPDM Panels"—T. H. Yoon, M. Sheridan and J. E. McGrath, NSF Science & Technology Center: VPI&SU, USA

- 11:00 - 11:20 "Effect of Surface Preparation on Wettability and Adhesive Bonding of Aged Roofing Membranes"—*T. Nguyen* and *Walter J. Rossiter, Jr.*, National Institute of Standards and Technology, USA
- 11:20 - 11:40 "A New Surface Treatment of Vulcanized Rubber"—*N. Pastor-Sempère*, *A. C. Orgilés-Barceló*, INESCOP, and *J. M. Martín-Martínez*, Universidad de Alicante, SPAIN
- 11:40 - 12:00 "Surface Pretreatment and Adhesive Bonding of Carbon Fiber-Reinforced Composites"—*J. W. Chin* and *J. P. Wightman*, VPI&SU, USA
- 12:00 - 1:30 Lunch

## SESSION B2 INTERPHASES

*Session Chair: J. G. Dillard, VPI&SU*

- 1:30 - 1:50 "Chemical and Mechanical Analysis of Cu-Polyimide Interfaces"—*G. D. Davis* and *B. J. Rees*, Martin Marietta Laboratories, *K. M. Liechti* and *A. Shirani*, University of Texas at Austin, USA
- 1:50 - 2:10 "Interdiffusion of Polymer Materials at Interfaces of MultiLayer Coating Systems: Implications for Adhesion"—*J. W. Holubka*, *T. J. Prather*, *S. L. Kaberline*, *P. J. Schmitz* and *J. E. deVries*, Ford Motor Company, USA
- 2:10 - 2:30 "Interlayer/Interphase Effects in Graphite-Epoxy Composites"—*J. Bell*, Institute of Materials Science, USA
- 2:30 - 2:50 "Influence of the Surface Chemistry on the Wettability of Stainless Steel"—*M. Mantel* and *J. P. Wightman*, VPI&SU, USA
- 2:50 - 3:10 "Interfacial Fracture of Sealant Joints"—*N. E. Shephard* and *J. P. Wightman*, VPI&SU, USA
- 3:10 - 3:30 Break

## SESSION B3 SURFACE ANALYSIS

*Session Chair: T. Nguyen, NIST*

- 3:30 - 3:50 "A Temperature-Programmed Desorption Technique for Studying Acid-Base Surface Properties of Thick Metal Sheets"—*E. Peillex*, *J. P. Joly* and *F. Gaillard*, Université Claude Bernard, FRANCE, *D. Verchere*, IRSID, FRANCE and *M. Romand*, Université Claude Bernard, FRANCE

- 3:50 - 4:10 “Fast Atom Bombardment Mass Spectroscopy and Surface Energy Measurements on the Adhesive Bond between Emulsion Adhesives and Polystyrene”—*J. Comyn*, D. C. Blackley and L. M. Harding, De Montfort University, UK
- 4:10 - 4:30 “Adsorption of Water to the Molybdenum/Adiprene Interface Measured by Neutron and X-ray Reflectivity”—*M. S. Kent* and D. MacIntyre, Sandia National Labs, USA, G. Smith and S. Baker, Los Alamos National Laboratories, USA and A. Nyitray and J. Browning, Martin Marietta Corporation, USA
- 4:30 - 4:50 “Silica Surface and Interfaces Probed by Evanescent Wave Infrared Spectroscopy”—*J.-M. Berquier*, M.-J. Azzopardi and *H. Arribart*, Laboratoire CNRS/Saint-Gobain, FRANCE
- 4:50 - 6:00 Break

6:00 - 7:30 **POSTER SESSION**

*Session Chair: TBD*

1. “Environmental Stress Cracking in Adhesives”—*D. A. Dillard*, H. Parvatareddy and A. P. Clifton, VPI&SU and S. Johnson and T. St.Clair, NASA Langley Research Center, USA
2. “Phenylethynyl Terminated Poly (Arylene Ether) Adhesives”—*B. J. Jensen*, R. G. Bryant and P. M. Hergenrother, NASA Langley Research Center, USA
3. “Acoustic Microscope Investigations of the Carbon Fiber Polymer Matrix Interphase in Composites”—*B. T. Smith*, Y. Verma, A. Ananda and S. P. Wilkinson, College of William & Mary, USA
4. “Acrylic Adhesives for Polyolefins”—*J. T. Fields*, J. Yang and A. Garton, University of Connecticut, USA
5. “Applications of Plasma Processes in Adhesion Sciences”—L. Deshayes, A. Alami, M. Charbonnier, N. S. Prakash and *M. Romand*, Université Claude Bernard, FRANCE
6. “Accelerated Life Testing of Adhesives and Adhesively Bonded Joints”—S. Ponnkanti, *J. Bulluck*, R. Rushing and S. Thornton, Texas Research Institute—Austin and P. Albrecht, University of Maryland, USA

7. "Investigation of Polyamine-Quinones as Hydrophobic Curatives for Epoxy Resins"—  
R. A. Rushing, *J. Bulluck* and S. Thornton, Texas Research Institute—Austin, C. Thompson, Naval Research Laboratory, Underwater Sound Reference Detachment and P. E. Cassidy, Southwest Texas State University, USA
8. "Particle Adhesion in Aqueous Medium. Influence of the Acid-Base Surface Properties"—  
X.-Y. Lin and *H. Arribart*, Laboratoire CNRS/Saint-Gobain, FRANCE
9. "The Influence of Fiber Size Developed Interphases on Interlaminar Fracture Toughness"—  
*J. J. Lesko*, S. Subramanian, D. A. Dillard and K. L. Reifsnider, VPI&SU, USA
10. "The Impact/T-Peel Performance of Toughened Epoxy Resin Adhesives"—  
*D. K. Hoffman*, A. Goldstein, L. Lopez and T. Dergazarian, Dow Chemical Co., USA
11. "Altering the Fiber Matrix Interphase in Semicrystalline Polymer Composites"—  
*R. L. Clark, Jr.*, Virginia Tech, USA
12. "Synthesis and Characterization of Soluble, High Temperature Adhesives Based on Thermoplastic Polyimides"—  
*G. W. Meyer*, and J. E. McGrath, NSF Science & Technology Center: VPI &SU, USA
13. "Surface Characterization of Inorganic and Polymer Plasma Treated Metals"—  
*K. L. Wolfe* and J. G. Dillard, Virginia Tech, USA
14. "Adhesively Bonding Flanges to Composite Tubes for Space Applications"—  
*C. F. Shaeffer* and J. D. Galbraith, USAF Phillips Laboratory, USA
15. "Adhesively Bonding of Attachments to Composite Isogrid Panels"—  
*C. F. Shaeffer*, J. L. Koury and T. D. Kim, USAF Phillips Laboratory, and J. A. Harvey, University of Dayton Research Institute, USA
16. "Bond Performance Degradation of a Highly Filled Epoxy Adhesive Due to Ambient Temperature Storage"—  
*G. L. Anderson*, P. A. Doan, M. R. Haddock, K. J. Kolonko and M. E. Prince, Thiokol R&D/Wasatch Division, USA
17. "Time Dependence of Structural Adhesive Bondlines"—  
*R. A. Crook* and D. Richardson, Thiokol R&D/Wasatch Division, USA

18. "The Development of Pretreatments for the Adhesion of Specialised Marine Coatings"—  
*R. J. Davies, M. Ritchie and N. C. Chamberlain, Railtech Ltd., UK*
19. "Steel/Rubber Adhesion Performance Sensitivity to Contamination"—  
*L. L. Kolonko, Thiokol Corp., USA*
20. "Evaluation of Adhesive Bonds Between Thermoset and Thermoplastic Composites"—  
*S. H. McKnight and J. W. Gillespie, Jr., University of Delaware, USA*
21. "The Effect of Coatings on the Structures and Properties of the Interphase in Composite Materials"—  
*T. P. Skourlis and R. L. McCullough, University of Delaware, USA*
22. "Polymer Orientation in the Polyimide/Aminosilane/SiO<sub>2</sub> Interphase"—  
*K. Bierbaum, C. Wöll, A. Schertel and M. Grunze, Der Universität Heidelberg, FRG*
23. "Effect of Particle Charge of Adhesion"—  
*D. Rakov, Eastman Kodak Co., USA*
24. "Tribocharging of Multi-Component Powder Mixtures"—  
*J. H. Anderson and E. Larson, Eastman Kodak Co., USA*
25. "Particle Resuspension from Rough Surfaces in Turbulent Streams"—  
*G. Ahmadi, Clarkson University, USA*
26. "Dynamic Adhesion-Induced Deformation of Submicron Particles"—  
*S. Krishnan, A. A. Busnaina, D. S. Rimai and L. P. DeMejo, Clarkson University and Eastman Kodak Co., USA*
27. "A Method of Determining the Contact Area between a Particle and a Substrate Using Scanning Electron Microscopy"—  
*R. Bowen, Eastman Kodak Co., USA*
28. "Adhesion of Fusion Bonded Epoxy Coating on Steel in Alkaline Solution"—  
*D. Alsheh, T. Nguyen and J. W. Martin, National Institute of Standards & Technology, USA*



**TUESDAY, FEBRUARY 22, 1994****SESSION C1****INTERPHASE STUDIES***Session Chair: L. H. Peebles*

- 8:00 - 8:20 "The Mechanical Behavior of Interphases in a Glass Fiber Reinforced Unsaturated Polyester"—*A. T. DiBenedetto* and *S. M. Connelly*, University of Connecticut, USA
- 8:20 - 8:40 "In-Situ Electron Microscopy Studies of Metal-Metal Oxide/Graphite Interactions"—*R. Terry Baker*, Pennsylvania State University, USA
- 8:40 - 9:00 "Interfacial Shear Strength of Oxide Films on Carbon Fibers Formed by the Sol-gel Process"—*T. Jung* and *R. V. Subramanian*, Washington State University, USA
- 9:00 - 9:20 "The Effect of Carbon Fiber Surface Chemistry on Bismaleimide Adhesion"—*C. L. Helsey*, *P. A. Wood*, *J. E. McGrath* and *J. P. Wightman*, VPI&SU, USA
- 9:20 - 9:40 "Effect of Fatigue on Interfacial Shear Strengths of Fiber/Resin Interphases"—*U. Gaur*, *C. T. Chou* and *B. Miller*, TRI/Princeton, USA
- 9:40 - 10:00 "Durability Studies of the Fiber Matrix Interface"—*M. Shioya*, *W. G. McDonough*, *C. L. Schutte* and *D. L. Hunston*, National Institute of Standards and Technology, USA
- 10:00 - 10:20 Break

**SESSION C2****INTERPHASE STUDIES***Session Chair: L. H. Peebles*

- 10:20 - 10:40 "Influence of Matrix Properties on Fragmentation Test"—*J. P. Armistead* and *A. W. Snow*, Naval Research Laboratory, USA
- 10:40 - 11:00 "Control of Interfaces in Polymer/Cellulose Composites by Plasma Treatments: Effects on Mechanical Properties"—*J. Felix* and *P. Gatenholm*, Chalmers University of Technology, SWEDEN, and *H. P. Schreiber*, Ecole Polytechnique, CANADA

- 11:00 - 11:10 Presentation of The Adhesion Society Award for Excellence in Adhesion Science, Sponsored by 3M to L. T. Drzal
- 11:10 - 12:00 “Chemical, Physical and Morphological Aspects of the Interphase in Composite Materials and Their Role in Fiber-Matrix Adhesion”—*L. T. Drzal*, Michigan State University, USA
- 12:00 Lunch

### FREE AFTERNOON

#### SESSION C3

#### NON-DESTRUCTIVE EVALUATION OF ADHESIVELY BONDED JOINTS

*Session Chair: V. Kinra, Texas A&M University*

- 7:20 - 7:40 “Thermal-Wave Imaging of Adhesive Disbonds”—*L. D. Favro, P. K. Kuo, R. L. Thomas, T. Ahmed, Z. J. Feng, H. J. Jin and X. Wang*, Wayne State University, USA
- 7:40 - 8:00 “Nondestructive Characterization of Adhesive Bonds from Guided Wave Data”—*A. K. Mal* and *S.-S. Lih*, UCLA and *J. Bar-Cohen*, Jet Propulsion Laboratory, USA
- 8:00 - 8:20 “Low-Frequency Ultrasonic NDE of 3-Layered Media: The Inverse Problem”—*V. K. Kinra* and *C. Zhu*, Texas A&M University, USA
- 8:20 - 8:40 “Time-Domain Ultrasonic NDE of 3-Layered Media”—*C. Zhu* and *V. K. Kinra*, Texas A&M University, USA
- 8:40 - 9:00 “Ultrasonic Guided Waves for the NDE of Adhesively Bonded Joints in Aging Aircraft”—*J. Rose*, *R. Krishna* and *A. Pilarski*, Pennsylvania State University, USA
- 9:00 - 9:20 “Use of Acousto-Ultrasonics Evaluation and Geometric Weighting to Predict Performance of Adhesive Joints”—*S. J. Karhnak* and *J. C. Duke, Jr.*, VPI&SU, USA
- 9:20 - 9:30 Break
- 9:30 Business Meeting

**WEDNESDAY, FEBRUARY 23, 1994****SESSION D1****PARTICLE ADHESION***Session Chair: D. Rimai*

- 8:00 - 8:20 "Surface Roughness and Particle Adhesion"—*H. Mizes*, Xerox, USA
- 8:20 - 8:40 "Molecular Dynamic Modelling of Particle Adhesion"—*D. Quesnel*, University of Rochester, USA
- 8:40 - 9:00 "Attractive Forces between Micron-Size Particles: A Patch Charge Model"—*H. Pollock*, University of Lancaster, UK
- 9:00 - 9:20 "Kinetics of Particle Deposition and Detachment in Model Systems"—*E. Matijevic* and *N. P. Ryde*, Clarkson University, USA
- 9:20 - 9:40 "Particle Adhesion Kinetics"—*B. Dahneke*, Eastman Kodak, USA
- 9:40 - 10:00 "Overview of Particle Transport and Deposition in Turbulent Flow"—*G. Ahmadi*, Clarkson University, USA
- 10:00 - 10:20 Break

**SESSION D2****DEFORMATION AND FRACTURE ANALYSES  
OF ADHESIVELY BONDED JOINTS***Session Chair: M. G. Allen, Georgia Institute of Technology*

- 10:20 - 10:40 "The Effects of Three-Dimensional Stresses on the Failure of Single Lap Joints"—*R. D. Adams*, *R.G.H. Davies* and *G. A. Panes*, University of Bristol, UK
- 10:40 - 11:00 "Mechanics of the Single-Lap Adhesive Joint with Laminated Composite Adherends"—*M. Y. Tsai* and *J. Morton*, VPI&SU, USA and *F. L. Matthews*, Imperial College of Science, Technology and Medicine, UK
- 11:00 - 11:20 "Measurements of U, V and W Deformation Fields of a Cracked Adhesive Joint"—*Y. Wang* and *F. P. Chiang*, SUNY at Stony Brook, USA
- 11:20 - 11:40 "Fracture Load Predictions for Adhesive Joints"—*M. Papini*, *G. Fernlund* and *J. K. Spelt*, University of Toronto, CANADA

11:40 - 12:00 "Determination of Adhesive Joint Fracture Parameters"—H. Y. Ahmad and L. Edwards, Open University, UK

12:00 - 1:20 Lunch

### SESSION D3

#### GENERAL PAPERS

*Session Chair: TBD*

1:20 - 1:40 "Conduction Efficiency and Strength of Electronically Conductive Adhesives"—E. Sancaktar, and Y. Wei, Clarkson University, and M. A. Gaynes, IBM Endicott, USA

1:40 - 2:00 "An Assessment of the Bondability of Aluminum Oxide Reinforced Aluminum"—P. R. Bergquist and S. E. Wentworth, U.S. Army Research Laboratory, USA

2:00 - 2:20 "Measurement of Adhesion of Bonded Epitaxial Liftoff GaAs Thin Films to Silicon"—Y. Wang, M. G. Allen and N. M. Jokerst, Georgia Institute of Technology, USA

2:20 - 2:40 "Observation of Temperature Dependent Thicknesses in Ultrathin Polymer Films on Silicon"—W.-L. Wu, J. H. van Zanten and W. J. Orts, National Institute of Standards and Technology, USA

2:40 - 3:00 "Characteristics of Adhesion Development between Newspaper Fiber and Polypropylene During Mixing"—S. Ren and D.N.-S. Hon, Clemson University, USA

3:00 Adjourn