

	<i>Page</i>
Foreword	iii
Executive Body and Organization, American Vacuum Society . . .	iv
Symposium Notes	vii
Symposium Personalities	xi
Symposium Sessions and Moderators	xiv

PART I
GENERAL VACUUM TECHNOLOGY

Section I
Lubrication and Space Friction
(Invited Papers)

Lubrication and Wear in Space Systems—R. W. Parcel, F. J. Clauss, C. F. O'Hara and W. C. Young	3
The Application of Ultra-High Vacuum Techniques to Studies of Friction and Wear—A. J. Haltner	14
Cleavage Studies of Lamellar Solids in Various Gas Environments—P. J. Bryant, L. H. Taylor and P. L. Gutshall	21

(Contributed Papers)

Space Friction Evaluation of Sintered MoS ₂ Sleeve Bearings—J. C. Heindl and R. J. Belanger	27
Investigation of Combined Effects of Reactor Radiation and Vacuum on Selected Engineering Materials—E. E. Kerlin, C. E. Morgan and J. E. Warwick	32
Ion Bombardment and its Effects on the Optical Properties of Metals—D. L. Anderson	37

Section II
Freeze-Drying, Systems and Materials
(Invited Papers)

A Review of Freeze-Drying—D. H. Rest	42
Improvements in Rates of Freeze-Drying—J. C. Harper and C. O. Chichester	47

Table of Contents

	<i>Page</i>
(Contributed Papers)	
A Thermo-Electric Freeze-Dryer for Tissue—T. W. G. Rowe . .	54
Materials for Space Vehicle Use—C. Boebel, N. Mackie and C. Quaintance	59
Performance of Silicone Materials in Thermal-Vacuum Environments—C. L. Whipple and E. G. Curtindale	63
An Ultra-High Vacuum Controlled Temperature, Ultra Violet Irradiation Chamber—G. R. Blair and P. M. Blair, Jr.	69
The High Vacuum System Using Epoxy Resin and Glass Cloth for the Princeton Synchrotron—N. Oser and R. Westwig	72
Section III Sorption and Cryopumping (Contributed Papers)	
A New Theory on Adsorption and Desorption of Vapors—T. Kraus	77
The Variation in Outgassing Rate with the Time of Exposure and Pumping—K. W. Rogers	84
Sorption Measurements in Ultra-High Vacuum at Constant Pressure—R. A. Pasternak, B. Bergsnov-Hansen, R. Gibson and N. Endow	88
Gas Analysis with a Molecular Sieve—Y. Murakami and H. Okamoto	93
Gaseous Desorption at Low Pressures and Liquid Nitrogen Temperatures—D. M. Richardson and R. A. Strehlow	97
Continuous Cryotrapping of Hydrogen and Helium by Argon at 4.2°K—J. Hengevoss and E. A. Trendelenberg	101
The Measurement of the Speed of Cryopumps—W. W. Stickney and B. B. Dayton	105
Treatment of Vacuum Cryosorption—S. M. Kindall	117
Calculation Methods for the Design of Regenerative Cryosorption Pumping Systems—M. Manes and R. J. Grant	122
Section IV Diffusion Pumps, Backstreaming, Valves and Seals (Contributed Papers)	
Backstreaming in Baffled Systems—W. M. Langdon and E. G. Fochtman	128
Experimental Studies of the Effect of Nozzle Design Upon the Backstreaming Rate of Oil Diffusion Pumps—D. L. Stevenson	134

Table of Contents

	<i>Page</i>
Residual Gases in Ultra-High Vacuum Systems with Oil Diffusion Pumps—M. H. Hablarian and P. L. Vitkus	140
Some Characteristics of Unitarily Designed Ultra-High Vacuum Pumping Groups Based on Diffusion Pumps—B. D. Power, N. T. M. Dennis, and L. de Csernatony	147
Development of Diffusion Pumps—W. Bächler, R. Clary and H. Forth	153
Theory and Application of Metal Gasket Seals—W. R. Wheeler . .	159
Some New Techniques in Ultra-High Vacuum—T. H. Batzer and J. F. Ryan.	166
A 19 Inch Diameter Bakeable Metal Ceramic Seal—K. Kirchner .	170
A Fast Acting Ultra-High Vacuum Gas Inlet Valve and Its Use in the Production of Special Non-Stationary Pressure Distributions in the C Stellarator—G. Lewin and D. Mullaney.	176

Section V Getter and Ion Pumps (Contributed Papers)

Alternative Ion Pump Configurations Derived from a More Thorough Understanding of the Penning Discharge—W. Knauer and E. R. Stack	180
Sputter-Ion Pumps for Low Pressure Operation—S. L. Rutherford	185
A High Efficiency Magnetic Field Design for Large Ion Pumps—W. J. Kearns	191
Activated Sorption of Inert Gases in an Electrodeless Discharge—H. S. Maddix and M. A. Allen	197
Design and Performance of a 50,000 L/sec Pump Combining Cold Cathode Ion Pumping and Active Film Gettering—C. F. Brothers, T. Tom and D. F. Munro	202

Section VI Gauges (Contributed Papers)

Response of Modified Redhead Magnetron and Bayard-Alpert Vacuum Gauges Aboard Explorer XVII—G. P. Newton, D. T. Pelz, G. E. Miller, LtJG, USN, and R. Horowitz	208
A New Type of High Vacuum Gauge—H. H. Atkinson	213
The Effect of Filament Impurities on the Operation of Bayard-Alpert Ionization Gauges—D. R. Denison, H. F. Winters and E. E. Donaldson	218

Table of Contents

	<i>Page</i>
Effects of Electron-Surface Interaction in Ionization Gauges— W. C. Schuemann, J. L. de Segovia and D. Alpert	223
Reverse X-Ray Currents in Bayard-Alpert Ionization Gauges— W. H. Hayward, R. L. Jepsen and P. A. Redhead	228
A Cold Cathode Discharge Gauge for Ultra-High Vacuum Use— J. R. Young and F. P. Hession	234
High Sensitivity Pressure Probes for Use in the Millitorr Region—S. A. Gordon	238
An Improved Positive Ion Source for Mass Spectrometers—J. L. Peters and R. A. Denton	243
On Uncertainties in Calibration of Vacuum Gauges and the Prob- lem of Traceability—J. C. Simons, Jr.	246
Gauge Calibration in the Ultra-High Vacuum Range—W. D. Davis	253
The Performance Characteristics of Three Types of Extreme High Vacuum Gauges—F. Feakes and F. L. Torney, Jr.	257
The Dynamics of Pumping and Desorption in a Bayard-Alpert Ionization Gauge—H. I. Smith, Jr.	263
Section VII Techniques (Contributed Papers)	
Teflon Coatings for Ultra-High Vacuum Systems—J. H. Singleton	267
Differential Pumping of a Narrow Slot—E. Donath	271
A Fast Electrometer-Amplifier for Partial Pressure Gauges— A. Barz and P. Herrwerth	275
Mass Spectrometer Output Systems for Recording Changes in Gas Composition—B. R. F. Kendall	278
Detection of Leaks and Mercury Vapor in Vacuum Systems by Analyzing Light from Discharges—N. Milleron	283
Measurement of Vacuum in Image Orthicon Tubes—H. Kobayashi	287
Vacuum Measurement Techniques for Space Simulation Cham- bers—D. H. Holkeboer.	292
Investigation of Air and Water Vapor Pressures in a Five and a Six-Stage Steam Jet Ejector—D. H. Martin and C. H. Stallings	297
Education in Vacuum: a Practical Approach—R. R. LaPelle. . . .	301

Table of Contents

Page

PART II
THIN FILM TECHNOLOGY

Section I
Sputtering
(Invited Papers)

Sputtering Mechanisms—S. P. Wolsky	309
Preparation and Properties of Sputtered Films—M. H. Fran- combe	316
Reactive Sputtering—N. Schwartz	325

(Contributed Paper)

Some Properties of Sputtered Sulphide Films—T. K. Lakshmanan and J. M. Mitchell	335
--	-----

Section II
Semi-Conductor Films
(Invited Papers)

Formation Conditions, Structure, and Electrical Properties of Ge Films Deposited on Single-Crystal Substrates—B. W. Sloope and C. O. Tiller	339
Evaporation Techniques and Properties of InSb Films—E. B. Dale, G. Senecal and D. Huebner	348
Recrystallization of Cadmium Sulfide Films—R. R. Addiss, Jr. . .	354

(Contributed Papers)

Vacuum Deposited Cadmium Sulfide Thin Films—W. C. Boesman and G. G. Avis	364
Deposition Parameters Affecting Epitaxial Growth of Single Crys- tal Films—E. Krikorian and R. J. Sneed	368

Section III
Film Preparation
(Contributed Papers)

Some New Experimental Data on Profile Families for Linear and Ring Sources—C. Bugenis and L. E. Preuss	374
Thickness Uniformity on Rotating Substrates—K. H. Behrndt	379
Large Capacity Thin Film Evaporation Source—J. Lemke	385
Pinholes in Thin Films—G. V. Jorgenson and G. K. Wehner	388

Table of Contents

	<i>Page</i>
Vacuum Evaporator for Ultra-High Vacuum Fabrication of Multi-layer Devices—H. L. Caswell	393
Vacuum Techniques for Fabricating Integrated Cryoelectric Computer Devices—G. W. Leck	397
A High Capacity Vacuum Sputtering Machine—J. G. Needham	402
Design and Construction of a Modulated Molecular Beam Mass Spectrometer—R. W. Roberts and P. E. McElligott	407
A Modulated Beam Technique for the Measurement of Very Low Molecular Beam Intensities—J. B. Hudson, T. L. Donnelly and G. W. Sears	411
Deposition and Monitoring Apparatus for Preparing Passive Micro-Circuits—W. Steckelmacher, J. English, H. H. A. Bath, D. Haynes, J. T. Holden and L. Holland	415
Application of Molecular Amplification to Microcircuitry—A. F. and E. E. Kaspaul	422
Section IV Film Properties (Contributed Papers)	
Residual Resistivity in Chromium Films—I. G. Young and C. W. Lewis	428
Investigation of Thin Tantalum Films—H. J. Schuetze, H. W. Ehlbeck, and G. G. Doerbeck	434
The Detection Of Monolayer Adsorption on Silicon and Germanium by Low Energy Electron Diffraction—J. Morrison	440
Simultaneous Contamination and Conversion Effects in Germanium Heated to Temperatures in the Evaporation Range—J. E. Davey and M. D. Montgomery	444
Low Leakage Thin Film Capacitors—R. A. Rossmeisl and F. M. Uno	449
A Bridging Phenomenon in Growth on Evaporated Metal Films—R. F. Adamsky and R. E. LeBlanc	453
The Sticking Coefficient, The Optical Transmission, and the Oxidation of Thin Metallic Films—S. Aisenberg	457
The Measurement of the Optical Properties of Copper in a Vacuum Environment—W. T. Spencer and M. P. Givens	463
Conductivity and Surface Potential Change of Cadmium Films Due to Adsorption—M. Onchi	466
Work-Function Measurements and Lattice Defects—J. A. Dillon, Jr., and R. M. Oman	471

Table of Contents

	<i>Page</i>
Preparation and Properties of Electroluminescent ZnS:Cu, Mn, C1 Films—J. Nickerson and P. Goldberg	475
Thickness and Composition of Nickel-Chromium Films—H. J. Degenhart and I. H. Pratt	480
The Preparation and Properties of Silicon Monoxide Capacitors on Passivated Silicon Substrates—E. R. Dean	485
Production of Hydrocarbons on Barium Films—P. della Porta and T. A. Giorgi	491
Vaporization of Iron-, Nickel-, and Cobalt-Base Alloys Between 760–980°C and 5×10^{-7} to 1×10^{-9} Torr—D. T. Bourgette.	497
The Microstructure and Some Related Electrical Properties of Tantalum Films—N. J. Maskalick, C. W. Lewis and A. M. Reingold.	503