

Plasma Surface Engineering

Editors:

E. Broszeit
W. D. Münz
H. Oechsner
K.-T. Rie
G. K. Wolf

Volume 2

894/2



INFORMATIONSGESELLSCHAFT · VERLAG

Table of Contents

Volume 1

General Aspects

- Plasma Surface Engineering: Technological Trends and Impacts 3
A. Hauff, Hanau, FRG
- The Plasma Environment in Inorganic Thin Film Deposition Processes 15
D. M. Mattox, Albuquerque, NM, USA

Modelling of Plasma Assisted Deposition

- Mechanisms of Metal Film Oxidation in the Pressure Range
 10^{-10} to 1 bar O_2 37
E. Fromm, V. Grajewski, H. H. Uchida, Stuttgart, FRG
- Reaction Probability of Nitrogen on the Titanium Nitride Film Formation
by Hollow Cathode Discharge Process 45
Y. Matsumura, H. Uchida, Y. C. Huang, Kangawa, Japan
- Mathematical Model for Carbon Supply Rate in Plasma Carburizing 53
Y. Zhao, Z. Zhang, S. Chen, D. Wang, Dalian, P.R. China
- Coating Thickness and Composition Uniformity in Plasma Assisted PVD 61
K. S. Fancey, A. Matthews, Hull, U.K.
- Ion Carburizing with Propane-Butane and Argon-Methane 69
D. I. Trifonov, Rousse, Bulgaria
- A Model of Growth of New Phase Layers under Plasma-Surface
Interaction 73
Z. A. Iskanderova, G. R. Rakhimova, USSR

Plasma Diagnostics

- Excited States of Plasmas for Steel Surface Nitriding 83
A. Ricard, Orsay, J. Oseguera, H. Michel, M. Gantois, Nancy, France
- Spectroscopic Studies of $N_2-H_2-TiCl_4$ Glow Discharge used for TiN
Deposition 91
B. Kulakowska, W. Zyrnicki, N. Badowski, Wroclaw,
T. Wierchoń, T. Karpiński, Warsaw, Poland
- Characterization of Low Pressure High Frequency Plasmas by DC Probe
Measurements 99
K. Franzreb, A. Fuchs, H. Oechsner, Kaiserslautern, FRG

Study of Probe Diagnostics in Plasma Polymerization Process
by Means of Computer Experiment 107
S. Novák, Ústí n/L, R. Hrach, V. Hrachová, Prague, CSSR

Spectral Diagnostics of Glow Discharge in N₂, Ar and N₂-Ar Atmospheres 115
B. Kulakowska, W. Zyrnicki, Wroclaw, Poland

Plasma Assisted CVD of Hard Coating

Plasma Assisted CVD of TiN on Steels and Geometric Effects 125
K.-T. Rie, St. Eisenberg, A. Gebauer, Braunschweig, FRG

Plasma-CVD of Cemented Carbides 133
R. Tabersky, H. van den Berg, U. König, Essen, FRG

Deposition of Titanium Nitride by RF Frequency Plasma CVD 139
H. P. Lorenz, Erlangen, FRG

The Properties of the Titanium Nitride Deposited by
Plasma Enhanced Chemical Vapour Deposition 147
D. H. Jang, S. B. Kim, J. S. Chun, Seoul; J. G. Kim, Incheon, Korea

Plasma Chemical Vapour Deposited Hard Coatings 155
S. Li, Y. Shi, X. Xu, H. Yang, C. Zhao; Qingdao, P.R. China

Plasma Assisted CVD of TiN-like Coatings 163
F. H. M. Sanders, Eindhoven, NL

TiC-Layers on Steel by Pulsed DC-Plasma CVD 171
K.-T. Rie, K. Detjen, S. Eisenberg, Braunschweig, FRG

Formation of Titanium Nitride and Composite Layers under Glow
Discharge Conditions 177
T. Wierzchoń, J. Michalski, T. Karpiński, Warsaw, Poland

Examination of the Growth of a-Si:C:N:H-Films from
a Hexamethyldisilazane-Plasma 185
K. W. Gerstenberg, Hamburg, FRG

Overview on CVD and PVD Coated Carbide Metalcutting Tools 191
D. T. Quinto, Greensburg, USA

Plasma Diffusion Treatment

Plasma Assisted Diffusion Treatment 201
K.-T. Rie Braunschweig, FRG

Some Observations on Plasma Nitriding Austenitic Stainless Steel 219
P. A. Dearnley, Cambridge; G. G. A. Hibberd, T. Bell, Birmingham, U.K.
A. Namvar, Kashan, Iran

Plasma Nitriding with Air 227
H.-J. Kölbel, Th. Lampe, G. Laudien, Wolfsburg, FRG

The Effect of Partial Nitrogen Pressure on the Formation of Nitride Layers on Steels J. Stanislav, V. Kubicek, P. Hubner, V. Prochazka, Prague, CSSR	233
Plasma Diffusion Treatment of Sintered Materials – An Austenitic Thermochemical Process K.-T. Rie, F. Schnatbaum, Braunschweig, FRG	241
Ion-Sulfo-Carbonitriding of Steel in the Vapor of Mixed Ammonia-Alcohol-Carbon Disulfide B. Q. Wang, Xian, P.R. China	251
Progress in the Control of Plasmanitriding and -carburizing for better Layer Consistency and Reproducibility B. Edenhofer, Kleve, FRG	257
Plasma Nitriding: Processes and Mechanisms A. Leyland, K. S. Fancey, A. Matthews, Hull; T. Bell, Birmingham, U.K. S. C. Kwon, M. J. Park, Changwon, S. Korea	269
Plasma(Ion)nitriding and Plasma(Ion)nitrocarburizing Its Units and its Applications F. Hombeck, W. Oppel, W. Rembges, Leverkusen, FRG	277
The Effects of Nitrogen on Surface Layer Structures of Plasma Complex-treated GCr15 Steel J. Sun, L. Yang, G. Feng, Dalian, P.R. China	289
The Research of a Complex Craft of Non-Etching Iron Plating-Ionitrocarburizing X. Hu, L. Yang, X. Ni, D. Yang, Dalian, P. R. China	295
The Study on the Feature of Plasma Carburizing G. Li, L. Yang, Dalian, P.R. China	299
A Study on Plasma Carburizing without Auxiliary Heater L. Yang, S. Liu, Dalian, P.R. China	305
Plasma Carburizing as an Alternative Process of Carburizing St. Eisenberg, K.-T. Rie, Braunschweig, FRG	311

Plasma Spraying

The Deposition of Turbine Blade Coatings Using Low-Pressure, Multigun Plasma Spray Processing J. R. Rairden, D. M. Gray, Schenectady, NY, USA	321
Effect of Coating Configuration and Heat Treatment on the Thermal Shock Resistant Properties of Ceramic Plasma Sprayed Coatings M. Fukumoto, N. Ueyama, I. Okane, Toyohashi, Japan	327

Influence of Porosity on the Properties of Plasma Sprayed Zirconia Coatings H.-D. Steffens, U. Fischer, Z. Babiak, Dortmund, FRG	335
On the Behaviour of Overlay Coatings in Stationary Gas Turbines B. Basler, W. Hoffelner, Baden, CH; R. Bürgel, Mannheim, FRG	347
Production and Application of Thick and Non-porous LPPS-Coatings of Nimonic 90 on Tools for the Production of Special-Type Glasses J. Disam, Mainz, FRG; A. Sickinger, Irvine CA, USA; V. Wilms, G. Jöhner, Hanau, FRG	355
The Microstructural Characterization of Plasma Sprayed and Physical Vapor Deposited Partially Stabilized Zirconia Thermal Barrier Coatings E. Y. Lee, R. R. Biederman, R. D. Sisson, Jr., Worcester, MA, USA	365
Design of a Computer-Controlled Vacuum Plasma Spray System for Production Applications H.-M. Höhle, W. Dietsch, Hattersheim FRG	373
Upgrading of Plasma Sprayed Coatings by Laser Treatment for Corrosion Resistance and by Hot Isostatic Pressing for Wear Resistance M. Hannotiau, J. Leunen, J. Sleurs, S. Heusdains, H. Tas, Mol, Belgium	387

Microelectronics, Electrical and Magnetical Layers

Plasma Diagnostics in Reactive Low Pressure Discharges K. Wiesemann, Bochum, FRG	397
Influence of RF-Diode, RF-Magnetron and DC-Magnetron Mode on the Crystallographic and Magnetic Properties of Sputtered Co-Cr Films A. Werner, H. Hibst, E. Hädicke, Ludwigshafen, FRG	415
In Situ Magneto-Optically Controlled Thin Film Growth D. Weller, W. Reim, Erlangen, FRG K. Balasubramanian, Tucson, Arizona, USA	423
Electrical Tests of LPCVD Tungsten Layers for VLSI Metallization M. Pospisil, F. Slaby, J. Gurovic, Prague, CSSR	431
Preparation of PECVD-Silicon-Nitride and PECVD-Silicon-Oxide Layers for Semiconductor Production in an ASM Horizontal-Tube-System K. Möhring, Hamburg, FRG	435
Preparation of YBaCuO Films by d.c.Magnetron Sputtering W. Shi, J. Sun, L. Liu, Zh. Qi, Hefei, P.R. China	443
Silicon Dioxide Deposition by Use of Microwave Plasma M. Oda, Y. Kinoshita, T. Kobayashi, Hyogo, Japan	451

Etching

- Characteristics of Etching $Ga_xAl_yIn_{1-x-y}As$ by RIE and CARIBE 459
A. P. Webb, P. V. Dennis, Caswell, Towcester, U.K.
- High Flux Plasma Etching at Low Ion Energies 465
A. D. Kuypers, H. J. Hopman, Amsterdam, NL
- Inhibitor Films as Microetching Tools in Pattern Transfer Technology 473
I. W. Rangelow, R. Kassing, Kassel, FRG
- Fence-like Residue Formation during Aluminum Dry Etching 479
I. Daraktchiev, F. Cassiers, D. Goossens, St-Niklaas, Belgium
- Modification of SiO_2 Surface with Electron, Ion Beam and Plasma 491
J. Han, P. Wang, Z. Jin, F. Chen, M. Chen, Beijing, P.R. China
- Multistep RIE of Aluminium and its Alloys 495
I. Hussla, P. Baumann, G. Castrischer, H. Grünwald, G. Lorenz,
H. Ramisch, Alzenau, FRG; P. Banks, Oxford, U.K.
- Computer On-line Reflectometry for End-point Detection
and System Control of Plasma-Induced Etching and Deposition 503
G. Lorenz, K. Enke, I. Hussla, T.-M. Pang, C. Schmitt, Alzenau, FRG
P. Banks, Oxford, U.K.
- Planarization of Oxide Films in Double Metal Technologies by
Using a Resist Etch Back Technique 511
J. Frick, K. Pfeifer, Hamburg, FRG

Physical Vapor Deposition

- Plasma Assisted PVD Coating Technologies, Industrial Practice 521
E. Bergmann, E. Moll, Balzers, Liechtenstein
- An Investigation on Plasma Assisted Plating System for Thin
Film Engineering 529
Z. B. Hui, W. Y. Ding, Shanghai, P.R. China
- Investigation of Plasma Deposited (Ti,Al)N Coating on Aluminium Alloys 535
Z. Gu, C. Jiang, L. Yang, Dalian, P.R. China
- Ion Bombardment Effects on (Ti,Al)N Deposits by Biased Activated
Reactive Evaporation 541
B. H. Hahn, J. H. Jun, J. E. Lim, Seoul, Korea
- Alternative Nitride Coatings by Cathodic Arc Evaporation 547
H. Randhawa, Boulder, CO, USA; H. M. Gabriel, Weiterstadt, FRG
- Steered Arc Technology 553
E. Ertürk, H.-J. Heuvel, H.-G. Dederichs, Bergisch Gladbach, FRG
- Preparation and Application of Thin Films on Flexible Substrates 561
W. Müller, V. Fronz, V. Neveling, W. Siefert, Freiburg, FRG

Study of Plasma Nitro-Carbo-Titanizing of Steel and Cast Iron Surfaces 569
L. Yang, D. Yang, Y. Li, Dalian, P.R. China

Sputtering

Development of New Wear-Resistant Low-Temperature
Coatings by Magnetron Sputtering 579
O. Knotek, M. Atzor, F. Jungblut, Aachen, FRG

Titanium Nitride Thin Films Deposited by Reactive Magnetron Sputtering 587
G. P. Georgiev, D. N. Popov, Rousse, Bulgaria

Production and Optimization of Hard Coatings of Tungstene Carbide
with Cobalt 595
A. Cavaleiro, M. T. Vieira, C. S. Furtado, Coimbra, Portugal;
G. Lempérière, J. M. Poitevin, Nantes, France

Decorative Coatings by PVD 603
H. Erhart, S. Bastian, H. Petersen, Wilster, FRG

High Temperature Electrical Insulating Properties of RF Magnetron
Sputtered Alumina Coatings on Copper 609
P. Vuoristo, T. Mäntylä, P. Kettunen, Tampere, Finland

Influence of Target Properties on Sputtering Process and Thin
Films for Magnetooptics 617
L. A. Berchtold, St. U. Schittny, W. Böhm, E. Schultheiß, P. Wirz, Hanau, FRG

Effect of Target Structure on the Magnetic Properties of MO Films
Produced in a Large Scale Sputtering System 625
E. Schultheiß, G. Bräuer, P. Wirz, St. U. Schittny,
L. A. Berchtold, Hanau, FRG

The Etching Effect on Ti Target during d.c.Magnetron Sputtering 633
W. Yao, Sh. Tung, W. Shi, Zh. Qi, Hefei, P.R. China

Model Attachment for Hard-Coating of Tools by Magnetron High-Rate
Sputtering 637
W. Precht, K. Reszka, W. Telinski, Koszalin, Poland

Structure and Properties of Magnetron-Sputtered
Hard Coatings in the Ti-Zr-N System 643
O. Knotek, M. Atzor, Aachen, FRG

Powder Target Process for Sputtering High T_c Superconducting Films 649
W. G. Luo, A. L. Ding, Y. H. Huang, H. R. Zhuang, Shanghai, P.R. China

Some Features of Triode Magnetron Sputtering 655
Q. X. Shen, L. F. Wang, Z. Y. Liu, Baotou, P.R. China

Comparison of Reactive Deposition of TiN_x Films by Magnetron Sputtering
and Arc Evaporation 661
J. Vyskočil, J. Musil, S. Kadlec, Prague, CSSR; W.-D. Münz, Hanau, FRG

Volume 2

Physical Film Properties

- Residual Stress and X-Ray Elastic Constants in Highly Textured PVD Coatings 671
R. Y. Fillit, St. Etienne, France; A. J. Perry, Troy MI, USA
- Surface Treatment of PP Films by a non Equilibrium Low Pressure Plasma of NH_3 , N_2 , Ar 679
V. André, F. Tchoubineh, F. Arefi, P. Montazer-Rahmati, J. Amouroux, Paris, France
- Effect of Thickness on the Porosity and Surface Roughness of TiN and (Ti, Al) N Deposited by Ion Plating Techniques 687
H. Freller, H. P. Lorenz, Erlangen, FRG
- Measurement of Residual Stress in Vacuum Plasma Sprayed Alumina Coatings 695
R. Kingswell, K. T. Scott, Didcot; D. T. Gawne, Uxbridge, U.K.

Compositional and Depth Profile Analysis

- Recent Progress in Surface and Thin Film Analysis 705
H. Oechsner, Kaiserslautern, FRG
- Ion Beam Analysis of Contaminants in Plasma Deposited Titanium Nitride Films 721
J.-P. Hirvonen, R. Lappalainen, A. Anttila, E. Sirviö, Helsinki, Finland
- Complementary Capabilities of LEEIXS and GDOS Methods to Characterize Surface Films 729
M. Charbonnier, M. Romand, Lyon, R. Berneron, St. Germain en Laye, France
- Calibration of SNMS Depth Profile Analysis 737
A. Wucher, H. Oechsner, Kaiserslautern, FRG
- Characterization and Properties of Germanium Oxide and Mixed Lithium-Germanium Oxides Thin Films 739
K. Awitor, G. Baud, J.-P. Besse, C. Caperaa, M. Jacquet, Aubiere, France
- Composition and Properties of Magnetron Sputtered TiN Coatings 745
J. Sikac, M. Cermak, Prague; J. Stanislav, Liberec, CSSR
- Quantitative AES Analysis of TiN_x and ZrN_x Multilayered Structures 751
P. Panjan, B. Navinšek, A. Žabkar, A. Zalar, Ljubljana, Yugoslavia

Glow-discharge-created Electron Beams. Applications in Soft X-ray Emission Spectroscopy M. Romand, F. Gaillard, M. Charbonnier, Villeurbanne, France	759
Depth Profiling of Low Temperature Deposited TiN _x Coatings W. Bolse, Th. Corts, A. Kehrel, Th. Weber, Göttingen F. J. Bergmeister, Frankfurt/M., FRG	767

Structural Analysis

Chemical and Structural Characterization of M _{100-x} N _x Thin Films prepared by Magnetron Reactive Sputtering (M = AISI 310 Stainless Steel, Molybdenum) A. Bourjot, M. Foos, C. Frantz, Nancy, France	777
X-ray Total Pattern Analysis of TiN Coatings V. Valvoda, R. Černý, R. Kužel Jr., J. Musil, V. Poulek, Prague, CSSR	785
Structures of BN Films deposited by the Thermally Assisted RF Plasma CVD with Tungsten Filament Y. Ichinose, T. Fujii, H. Saitoh, T. Ishiguro, Nagaoka, Japan	793
X-Ray Diffraction Studies on ZrO ₂ Polymorphs by Deconvolutive Methods S. Enzo, Venezia, L. Lutterotti, P. Scardi, Mesiano die Povo, Italy	799
Microstructure and Surface Morphology of Vacuum Copper Deposits S. Todorova, D. Tsaneva, K. Kanev, Rousse, Bulgaria	807

Tribology

Optimization of Surface Morphology and Tool Material for TiN (PVD) Efficiency in a given Tribo-System B. Navinšek, J. Brguljan, M. Peternel, Ljubljana, Yugoslavia	817
Influence of Fundamental Coating Properties on the Wear Behaviour of r.f.-Bias Sputtered TiN Tested in Model Wear Tests and in Practical Component Application Th. Roth, Obernburg; E. Broszeit, K. H. Kloos, Darmstadt, FRG	837
The Performance of PVD and CVD Hard Coatings on Tools for Metal Stamping and Plastics Injection Moulding Applications S.E. Franklin, Eindhoven, NL	845
Properties and Tribological Behaviour of Chromium Nitride Coatings on Soft Materials D. Dubiel, Stuttgart, FRG	853
Comparative Tests of TiN and TiAlN Coated Hobs in Gear Cutting Operations M. Zlatanović, P. Stošić, Beograd, Yugoslavia	861

Hard Coatings Produced by PVD-Techniques Based on Ti(C,B,N)-System D. Roth, H.-J. Erler, P. Morzeck, J. Liebich, C. Weissmantel, † Karl-Marx-Stadt, GDR	869
Plasma Heat Treatment and Coatings of Tools and Functional Components F. Jares, J. Stanislav, Prague, CSSR	877
Wear Resistance of Plasma Nitrided and Sputter Ion Plated Hobs M. Zlatanović, Belgrade, Yugoslavia; W. D. Münz, Hanau, FRG	895
Wear Properties Improvements of Plasma Nitrided Components of 42CrMo4 Steel M. M. Tošić, R. Gligorijević, Belgrade, Yugoslavia	903
Structure/Property Relationships for Hard Wear-Resistant Ceramic Coatings D. S. Rickerby, D. S. Whitmell, C. F. Ayres, Didcot, U. K.	911
Wear and Surface Characterization of Nitride-coated Punching Tools H. Freller, Erlangen; S. Hofmann, Stuttgart; H. A. Jehn, Schwäbisch Gmünd, FRG	919
The Principal Wear Mechanisms of Plasma Nitrided Low Alloy Steel Y. Sun, T. Bell, Birmingham, U.K.; P. A. Dearnley, Cambridge, U.K.	927
Study of PVD Coatings on Materials for Machine Parts G. Schullern, A. Mantini, Milano, Italy	935

Ion Beam Techniques and Ion Beam Sources

Ion Beam Mixing Techniques for Wear Reduction and Corrosion Protection G. K. Wolf, Heidelberg, FRG	945
Ion Bombardment Synthesis of Stable Nitride Layers R. G. Duckworth, Surrey, U.K.	963
Cavitation Erosion of TiN Films Produced by Ion Beam Enhanced Deposition at Room Temperature B. Q. Wang, Xian, P.R. China; H. Herman, Stony Brook NY, USA	971
Geometry Dependent Compositional Variations of Ion Beam Deposited NiFeMo Films D. Theirich, J. Engemann, Wuppertal, FRG	979
The Potential of Ion Beam Chemical Vapour Deposition for Producing Protective Coatings W. Ensinger, G. K. Wolf, Heidelberg, FRG	987
Thin TiN Films Obtained by RF Magnetron Sputtering and Reactive Ion Beam Assisted Deposition L. Guzmàn, M. Elena, F. Giacomozzi, O. Asturizaga, A. M. Narsale, D. C. Kothari, Povo, Italy	995

Depth Profiling of Nitride Surface Layers by Resonant Nuclear Reaction Analysis K. P. Lieb, W. Bolse, T. Corts, A. Kehrel, M. Uhrmacher, T. Weber, Göttingen, FRG	1003
Chemical Etching of Amorphous Hydrogenated Carbon Films by Hydrogen Atoms and Ions V. Philipps, E. Vietzke, M. Erdweg, K. Flaskamp, Jülich, FRG	1011
An RF Plasma Beam Source for Thin Film and Surface Technology H. Oechsner, H. J. Füber, J. Waldorf, A. Fuchs, Kaiserslautern, FRG	1017
A Novel Microwave Ion Source as a New Tool for Submicron Etching of Microelectronic Devices W. Möhl, Kirchheim bei München, FRG	1025
A High Current Ion Source for Line Shaped Ion Beams of Inert or Reactive Gases and Metals H. J. Füber, H. Oechsner, Kaiserslautern, FRG	1033
Modification of Ion Plated Ti-N Film by B Addition and N Ion Bombardment L. S. Wen, X. Z. Chen, Q. Q. Yang, Y. Q. Zheng, Y. Z. Chuang, Shenyang, P.R. China	1041
Study on the Microstructures and the Strengthening Mechanism of the M2 Steel Surface Modified by Nitrogen Ion Implantation F. J. Wang, L. L. Chen, X. Y. Li, Y. K. Wang, B. Q. Chen, Dalian, P. R. China	1047
Saturation Implantation of Kr Ions into Aluminium T. Weber, K. P. Lieb, M. Uhrmacher, Göttingen, FRG	1055

Production and Properties of Hard Carbon Films

Preparation of Amorphous i-C-Films by Ion Assisted Methods W. Scharff, K. Hammer, G. Schmidt, O. Stenzel, J. Ullmann, M. Vogel, T. Frauenheim, C. Weissmantel, Karl-Marx-Stadt, GDR	1065
Diamond Synthesis from Organic Compounds by RF Plasma CVD M. Yamamoto, K. Saitoh, Sapporo; M. Fukui, Odawara, Japan	1073
The Effect of Thermal Annealing on the Infrared Spectra of Amorphous Hydrogenated Carbon Films Prepared from Toluol R. D. Fang, Heifei, P.R. China; L. Ley, Stuttgart, FRG	1081
Mechanical and Chemical Characterisation of W-C:H Amorphous Layers W. v. Duyn, B. v. Lochem, Eindhoven, NL	1087
XPS Investigations of Tantalum Doped a-C:H-Layers M. Grischke, J. T. Harnack, C. Benndorf, F. Thieme, Hamburg, FRG	1093

Carbon Diffusion and Carbide Formation in Molybdenum coated with a-C:H U. Littmark, H. C. Paulini, D. M. Danailov, Jülich, FRG	1101
Influence of Preparation Conditions on the Deposition Rate and some Properties of Diamond-like Amorphous Carbon Films H. Z. Wang, R. C. Fang, Hefei, P.R. China	1109
Preparation and Analysis of a-C:H-Films Prepared in a Wide Pressure Range of rf-Glow Discharge H. Ehrhardt, R. Kleber, B. Scheppat, A. Fuchs, W. Dworschak, J. Scherer, K. Jung, Kaiserslautern, FRG	1113
The Effect of Deposition Temperature and Annealing on the Photoemission Spectra of Diamond-like Amorphous Carbon Films P. S. Xu, R. C. Fang, Hefei, P.R. China	1121
Growth and Properties of TiC and i-C Films obtained by Plasma Assisted Technics C. Lory, J. Machet, Limoges, France	1125
Model of the Structure of a-Si:C:N:H-Films Obtained by Plasma Polymerization of Hexamethyldisilazane K. W. Gerstenberg, Hamburg, FRG	1133

Application of Thin Films, Corrosion and Oxidation

Comparative Hot Corrosion Studies of PVD, Air and Vacuum Plasma Sprayed Coatings H.-J. Rätzer-Scheibe, K. Fritscher, Köln, FRG; M. Seiersten, Oslo, Norway	1141
Improvement of Zirconia Thermal Barrier Coatings by use of Plasma Assisted Physical Vapour Deposition A. S. James, A. Matthews, Hull, U.K.	1149
Oxidation Behaviour of Sputtered MoS ₂ -Films V. Buck, Essen; A. Eicke, Stuttgart, FRG	1157
Anodic Characteristics of the Nitride and Diffusion Zones on Plasma Nitrided Alloy Steels J. Flis, J. Mankowski, E. Rolinski, Warsaw, Poland	1165
Properties of Ion Vapour Deposited Aluminium Coatings J. Sikac, Z. Havrankova, Prague, CSSR	1173
Corrosion Protection by Plasma Assisted Vapour Deposited Silica Coatings M. J. Bennett, A. T. Tuson, C. F. Ayres, Didcot, U.K.	1179
Pitting Corrosion Behavior of Ion-Nitrided Stainless steel K. Ichii, K. Fujimura, T. Takase, Osaka, Japan	1187

Testing and Process Control

- Status and Directions of Modified Tribological Surfaces by Ion Processes 1195
T. Spalvins, Cleveland, Ohio, USA
- Scratch Testing Induced Surface Damage of Thin Coatings: A Study of Failure Mechanisms by Means of Appropriate Surface Analytical Tools 1215
J. von Stebut, Nancy, France
- Scratch Adhesion Testing of Hard, Wear Resistant Coatings 1227
S. J. Bull, D. S. Rickerby, Didcot; A. Matthews, A. R. Pace, A. Leyland, Hull, U.K.
- Plasma Diagnostics for Modelling of Vacuum Plasma Spraying 1235
H.-D. Steffens, M. Mack, R. Lauterbach, Dortmund, FRG
- Modification of Texture and Microstructure by Ion Bombardment during Deposition of TiN Film 1243
B. H. Hahn, J. H. Jun, Seoul, Korea

Optical Films

- Ion Beam Sputtered Mirrors for a Storage Ring free Electron Laser 1253
E. Kügler, R. Pfefferkorn, Balzers, Liechtenstein
M. W. Couprie, Orsay, France
- The Optical Properties of Ta₂O₅ Films and Ta₂O₅/SiO₂/Al₂O₃ Multilayer Systems Produced by rf Reactive Sputtering 1261
J. Zemlicka, L. Jastrabík, V. Zelezny, P. Bohac, Prague;
L. Malinovsky, Piestany, CSSR
- Silicon Oxinitride Thin Films Prepared by Plasma Enhanced CVD for Integrated Optics using the SiH₄/N₂/O₂/ Reaction 1267
D. Peters, J. Müller, Hamburg, FRG
- Oxygen Ion Assisted Deposition of Vanadium Oxide Thin Films 1275
L. Han, J. Gao, Beijing, P.R. China

Plasma Surface Modification

- Microwave Plasma Treatment of Polypropylen 1281
B. Tomcik, Belgrade, Yugoslavia
- Plasma Pretreatment for Conventional Printing of Wool 1285
W. G. Chen, J. L. Wei, S. L. Lu, D. Y. Tang, B. L. Shen, Y. S. Rao, Xian, P. R. China
- Flash Removal with Plasma 1291
G. Kowalski, Hamburg, FRG

List of Authors

Subject Index