

TABLE OF CONTENTS

Preface.....	<i>iii</i>
--------------	------------

VOLUME 1

FUNDAMENTAL SCIENCE OF CVD

Quantum Chemical Study of ZrO ₂ Atomic Layer Deposition on the SiO ₂ Surface G. Gao, J. Han, Y. Widjaja, E. Garfunkel, C. Musgrave Invited paper	1
Surface and Gas Phase Chemistry of the MOCVD of ZnSe D. Moscatelli, C. Cavallotti, M. Masi, S. Carrà.....	15
Effects of Heat Treatment of Silica and Precursor on the Surface Density of Aminosilanes Deposited Onto Silica by ALD S. Ek, E. I. Iiskola L. Niinistö.....	22
Non-Equilibrium Effects During Disilane Decomposition W. Tsang.....	30
Investigation of Gas Phase Decomposition Mechanisms in GaN-CVD by Theoretical Methods: The “Entropic Challenge” R. Schmid, B. Wolbank, D. Basting	39
Gas-Phase Kinetic Modeling in the AlCl ₃ -CO ₂ -H ₂ -HCl System in View of the Chemical Vapor Deposition of Al ₂ O ₃ P. Tan, J. Müller, D. Neuschütz.....	47
Thermodynamics and Reaction Pathways in the Decomposition, Oxidation, and Hydrolysis of Monobutyltintrichloride M. D. Allendorf, I. M. B. Nielsen, C. F. Melius, A. M. B. van Mol	55
Decomposition, Oxidation, and Hydrolysis Kinetics of Monobutyltintrichloride A.M.B. van Mol, M. Allendorf.....	65
Thermal Decomposition of Ti Precursors in Gas Phase J.S. Heo, Y.S. Cho, J.C. Kim, S.H. Moon	74

Heat and Mass Transfer of Chemical Deposition of Zinc-Selenide Layers V.G. Minkina	81
A Method to Extract Physical Properties from Raman Scattering Data in a CVD Reactor J. Hwang, M. Huang, T. Anderson, C. Park	85
Identification of Black Deposits Produced During the Hydride-OMVPE Growth of GaN C. Park, S. Han, C. Doh, S. Yeo, D. Yoon, S.-K. Hwang, K.-H. Lee T. Anderson.....	92
Quantifying Superconformal Filling of Submicrometer Features Through Surfactant Catalyzed Chemical Vapor Deposition D. Josell, S. Kim, D. Wheeler T. Moffat, S. Pyo,.....	98
NMR, X-Ray, and Mass Spectrometry Characterization of Some Heteroleptic Aluminum Alkoxide Complexes D. Baù, G. Carta, F. Benetollo, G. Rossetto, S. Tamburini, A. Turgambaeva, P. Zanella	104
Mechanisms of Thermal and Photo Assisted MOCVD Processes From M(hfac) ₂ Tetraglyme (M=Sr, Ba) Precursors G.G. Condorelli, G. Anastasi, S. Giuffrida, I. L. Fragalà	112
Thermal Properties of Ir(I) Precursors: Acetylacetonato (1,5-Cyclooctadiene) Iridium(I) and (Methylcyclopentadienyl) (1,5-Cyclooctadiene) Iridium(I) N. B. Morozova, N. V. Gelfond, P. P. Semyannikov, S. V. Trubin, I. K. Igumenov, L. Gimeno-Fabra	120
The Problem of the Storage Alkaline Earth Precursors Containing 2,2,6,6-Tetramethylheptanedione-3,5. V. Vertlib, A. Drozdov, I. Timokhin, S. Troyanov, C. Pettinari, F. Marchetti, Y. Min, D. Kim.....	128
A Correlation Between Volatility, and Molecular Structure: Spectroscopic Estimation of the Temperature for Onset of Sublimation in Metal β -Diketonates M. Das, S.A. Shivashankar	136

MODELING AND SIMULATION

From pyrocarbon CVD to pyrocarbon CVI G.L. Vignoles, F. Langlais, N. Reuge, H. Le Poche, C. Descamps, A. Mouchon Invited Paper	144
An Open-Source, Extensible Software Suite for CVD Process Simulation D. Goodwin.....	155
Procedure and Related Tools Proposed for the Modeling of Gas-Phase Mechanisms Involved in Chemical Vapor Deposition: Application to CVD of SiC S. de Persis, A. Dollet, F. Teyssandier.....	163
Heat Transfer in Very Low Pressure Stagnation Flow CVD Reactors R. Dorsman, C.R. Kleijn	171
Uniform Molecular Flux in a Vertical Reactor with Pulsed Transition Regime Gas Flow S. Krumdieck, J.-Y. Lee, and H. Raatz.....	179
Local Deposition Rates of α -Al ₂ O ₃ from AlCl ₃ -CO ₂ -H ₂ -HCl derived with PHOENICS-CVD from Thermogravimetric Measurements in a Hot-Wall Reactor with Long Isothermal Zone J. Müller, D. Neuschütz	186
Predictive Model Extraction from Commercial Scale Poly-Silicon LPCVD Reactor R. Shimizu, M. Ogino, M. Sugiyama, Y. Shimogaki	194
Tin Oxide Deposition in a Cold-Wall CVD Reactor: Computations and Experiments T.C. Xenidou, A.G. Diamantis, A.G. Boudouvis, D.M. Tsamakis, N.C. Markatos.....	202
Modeling Analysis of SiC CVD in the Horizontal Hot Wall Reactors A.K. Semennikov, R.A. Talalaev, A.N. Vorob'ev, Yu.N. Makarov	210
Modeling of Transport and Kinetic Processes in an Atomic Layer Deposition Reactor B. Devulapalli, J. McInerney, M. Dharan.....	218

Simulation of Epitaxial Silicon Deposition and Dopant Incorporation in an Industrial Barrel Reactor M. Di Stanislao, G. Valente, S. Fascella, M. Masi, S. Carrà, J. Y. Fei, S. Yarlagadda.....	226
Aerosol Dynamics Modeling and Computational Fluid Dynamics of a Laser-Driven Nanoparticle Synthesis Reactor S. Talukdar, C. Ng, M. Swihart	235
Thermodynamic Optimization of OMCVD Deposition of SrTiO ₃ E. R. Salinas, A. Pisch, C. Chatillon, C. Bernard	243
Design of MOCVD Film Growth in a Hot Wall Tubular Reactor G. A. Battiston, R. Gerbasi , K. T. Raic.....	249
Critical Issues in Group-III Nitride MOVPE Modeling E. Yakovlev, R. Talalaev, A. Vorob'ev, Y. Makarov	258
Simulation of Silicon Thermal Oxidation and Stress Analysis in Flash Memory Technology A. Veneroni, A. Beretta, M. Masi.....	266
Study of the Automatic Modeling of Reaction Systems for Chemical Vapor Deposition Processes Using Genetic Algorithms T. Takahashi, K. Funatsu, Y. Ema.....	272
Modeling of Thermo- and Mass-Transfer Processes at Sublimation of Molecular Crystals of CVD Precursors N. V. Gelfond, A. N. Cherepanov, A. N. Mikheev, V. K. Cherepanova, V. N. Popov, N.B. Morozova, I. K. Igumenov	279

PROPERTIES OF DEPOSITED MATERIALS: MEASUREMENT, MODELING, PREDICTION

Use of Surfactants in Organometallic Vapor Phase Epitaxy G.B. Stringfellow, D.C. Chapman, B.J. Kim, T.Y. Seong Invited Paper	287
Arrangement of Silicon and Oxygen Atoms in Low Pressure Chemically Vapor Deposited SiO ₂ Films by SiH ₄ -O ₂ and TEOS Chemistries: Comparison With Thermally Grown SiO ₂ Films V. Vamvakas, A. Pappa, D. Davazoglou.....	299

Formation Mechanism of Local Thickness Profile of Silicon Epitaxial Film H. Habuka, S. Fukaya, A. Sawada, T. Takeuchi, M. Aihara	307
Synthesis and Structural Characterizations of Vanadium Oxide Thin Films Prepared by MOCVD and ALD A. Mantoux, H. Groult, P. Doppelt, J.C. Badot, E. Balnois, N. Baffier, D. Lincot	316
Direct Injection Chemical Vapor Deposition of Textured Zirconium Oxide Films L. Rapenne, O. Bernard, A.M. Huntz, M. Andrieux, J.C. Poulin, C. Haut, W.Seiler	325
Morphological Studies of Focused Ion Beam Induced Tungsten Deposition H. Langfischer, S. Harasek, H. Wanzenboeck, A. Lugstein, B. Basnar, E. Bertagnolli	333
Mechanical Characterisation of Zirconium Oxide Thin Films Deposited by Chemical Vapor Deposition O. Bernard, L. Rapenne, A.M. Huntz, M. Rieux, S.Poissonnet	340
CVD Coating of Sapphire Fibers With hBN to Improve Mechanical Properties of Reinforced NiAl Composites K. Reichert, R. Cremer, D. Neuschütz.....	351
Microwave PACVD of Low Friction a-SiC Coatings: From Plasma Characterization to Material Mechanical Property L. Thomas, F. Teyssandier, M. Ducarroir, C. Boher, L. Autrique, J.M. Badie, R.Berjoan	359
Optical Characterization of Solid Phase Crystallization of Silicon Thin Films Obtained by LPCVD M. Modreanu, M. Gartner, C. Cobianu, P. Hurley	364
Electrical Properties of TiN Films Prepared by Plasma Assisted Atomic Layer Deposition Using Tetrakis(Dimethylamido)-Titanium D.-H. Kim, Y.J. Kim, and Y.S. Song.....	373
Interrelation of Bond Configuration and Optical Properties of μ c-SiC Thin Films by Spectroscopic Ellipsometry M. Losurdo, G. Iannuzzi, P. Capezzuto, G. Bruno	378

Optical Properties of Low Pressure Chemically Vapor Deposited Silicon Oxynitride Films From SiCl ₂ H ₂ -NH ₃ -N ₂ O Mixtures D. Davazoglou	386
Electrochromic Characterization of Mo-W Mixed Oxides and MoO ₃ Thin Films K. Gesheva, T. Ivanova, A. Kovalchuk, B. Gurtovoi, O. Trofimov	394
Electrochromism in WO ₃ and WO ₃ -Pt Doped Nanophasic Thin Films Deposited by MOCVD on Gold Substrates G. Carta, P.L. Cavallotti, M. Filippin, L. Magagnin, G. Rossetto, P. Zanella	401
Comparison of Photovoltaic Performance of SnO ₂ :F Coated Substrates Made Using APCVD With Different Sn Precursors A.M.B. van Mol, F. Grob, K. Spee, K. van der Werf, R. Schropp	408
The Influence of Film Thickness on Photoactivity for TiO ₂ Films Grown on Glass by CVD M. Nolan, D.W. Sheel, M. Pemble	417
MOCVD of Tungsten Nitride Thin Films from the Imido Complex Cl ₄ (CH ₃ CN)W(NiPr): Effect of NH ₃ on Film Properties O. Bchir, T. Anderson, B. Brooks, L. McElwee-White	424
Mass-Transfer and Doping Processes of the Inside Surfaces of Cast Iron Sleeves Using the Electrolyte-Plasma Treatment A.D. Pogrebnjak, O.P. Kul'ment'eva, Yu.N. Tyurin, A.P. Kobzev, A.G. Boyko, S.I. Golovenko	432

PROCESS CONTROL AND DIAGNOSTICS

Optical Probes of Atmospheric Pressure CVD Systems M. Pemble Invited Paper	439
MOCVD Materials for Electronic and Optoelectronic Applications K. Christiansen, M. Luenenbuerger, Y. Dikme, B. Schineller, M. Heukan, H. Juergensen	455
<i>In Situ</i> Monitoring of Thin Film Oxygen Diffusion by Macroscopic Curvature A.B. Tripathi, D.A. Boyd, D.G. Goodwin	463

Investigation of Gas-Phase Reaction Effective on Deposition Behavior in MOCVD-Pb(Zr,Ti)O₃ Film Using *In-Situ*-Monitored by Fourier Transform Infrared Spectroscopy

G. Asano, T. Satake, K. Ohtsuki, H. Funakubo 471

NON CONVENTIONAL CVD

Atomic Layer Deposition of Thin Films for Microelectronics

M. Ritala, M. Leskelä
Invited Paper 479

Characteristics of Tungsten Carbide Films Prepared by Plasma Assisted Atomic Layer Deposition using Bis (TerT-Butylimido) Bis (Dimethylamido)Tungsten

D. Kim, Y. Kim, Y. Song, B. Lee, J. Kim, S. Suh, R. Gordon
Keynote Speaker 491

Atomic Layer Deposition of Alumina from Trimethylaluminum and Ozone

P. Ho, C.-P. Chou, S. Mokhtari, J. Bailey, Y. Senzaki 503

Growth of SnO₂ Thin Films by ALD and CVD: A Comparative Study

J. Sundqvist, A. Härsta 511

Alkaline Earth Cyclopentadienyl Compounds as Precursors for Atomic Layer Deposition

T. Hatanpää, T. Hänninen, J. Ihanus, J. Kansikas, I. Mutikainen,
M. Vehkämäki, M. Ritala, M. Leskelä 516

Inside-Outside Densification of Carbon Fiber Preforms by Isothermal, Isobaric CVI

W.G. Zhang, K.J. Hüttinger 523

Fluidized Bed Chemical Vapor Deposition: State of the Art and Main Challenges

B. Caussat, P. Serp, C. Vahlas 530

Chemical Vapor Deposition in Spouted Bed Reactors

F. Juarez L., M.C. Lafont, F. Senocq, C. Vahlas
Keynote Speaker 538

Pyrolysis of Mixed Aerosols: A Versatile CVD-Based Process to Produce Clean and Long Aligned Multi-Walled Carbon Nanotubes

M. Hemite, X. Armand, D. Porterat, C. Reyraud.....549

Deposition of Thin Film Transition Metal Oxides (TMO) on Glass by Combustion Chemical Vapour Deposition (C-CVD)

G. Benito, M. J. Davis, S. J. Hurst, D. W. Sheel, M. E. Pemble557

Grafting Metalorganic Species into Mesoporous Silica from the Vapour Phase

A. N. Gleizes.....565

Kinetic Analysis of the Low Temperature CVD of Silicon/Silicon Carbide from Methyltrichlorosilane/Hydrogen for the Ceramization of Biomorphic Carbon Preforms

N. Popovska, D. Streitwieser, H. Gerhard, G. Emig.....573

PLASMA CVD AND OTHER ASSISTED METHODS

Laser-Induced Carbon CVD Using an Open-Air Reactor

K.H. Kwok, W.K.S. Chiu581

Titanium Dioxide Thin Film Deposition on Polymer Substrates by Light Induced Chemical Vapor Deposition

E. Halary-Wagner, F. Wagner, P. Hoffmann.....588

Atmospheric Pressure Deposition of Silica Thin Films by Photo-CVD Using Vacuum Ultraviolet Excimer Lamp

Y. Maezono, K. Nishi, A. Yokotani, K. Kurosawa596

Characterization of SiO₂ Films by Photo-CVD using a Xe₂ Excimer Lamp

J. Miyano, Y. Maezono, K. Toshikawa, A. Yokotani ,K. Kurosawa603

Physical Properties of SiO₂ Layers Deposited at Room Temperature by a Combination of ECR Plasma and High-Speed Jet of Silane

G. Isai, J. Holleman, P. Woerlee, H. Wallinga, M. Modreanu,
C. Cobianu609

Composite Nitrided + Ti(N,C,O) Type Layers Produced by PAMOCVD Processes

T. Wierzchon, J. R. Sobiecki, P. Mankowski, K. Rozniatowski617

Influence of the Microwave Power in an ECR-PECVD Reactor on Dielectric-Cap Induced Blue Shift in 1.55 μ m Laser Structures J. Wojcik, B. Robinson, D.A. Thompson, P. Mascher	624
Study of Precursors for Atmospheric Pressure Plasma Enhanced CVD (AP-PECVD) of Silicon Dioxide Films S.E. Alexandrov, M.L. Hitchman, N. McSporran	630
Low Temperature Processing of SiO ₂ Thin Films by PECVD Technique Using an Inductively-Coupled High-Density RF Plasma Source P. Joshi, S. Droes, J. Flores, T. Voutsas, J. Hartzel	638
Plasma CVD of Si/C/N: Experimental and Theoretical Results C. Berger, E. Broszeit, F. Falk, H. Hoche, E. Kroke, P. Kroll, D. Probst, R. Riedel, H. Stafast, V. Uhlitzsh, Y. Zhou.....	646
Bias Power Effect on Property of PECVD Low-k SiOCH Film Y. Shioya, T. Ohdaira, R. Suzuki, K. Maeda.....	653
Low Temperature Deposition of Microcrystalline Silicon Films by Plasma Assisted CVD A. Grimaldi, A. Sacchetti, M. Losurdo, M. Ambrico, P. Capezzuto, G. Bruno.....	661
Atmospheric-Pressure Plasma-Enhanced Chemical Vapour Deposition (AP-PE-CVD) for Growth of Thin Films at Low Temperature M.J. Davis, M. Tsanos, J. Lewis, D.W. Sheel, M.E. Pemble	668
Atmospheric Pressure Deposition of SiO _x Thin Films by Oxidation of Liquid HMDSO in Remote Plasma S. Huet, T. Belmonte, T. Czerwic, J.M. Thiébaut, S. Bockel	676
Optimizing Net Deposition Rates for a High Density Plasma CVD Process K. Niazi, Z. Chen, O. Karpenko	681
High-Density Plasma CVD Films of Aluminium, Gallium, and Indium Nitrides From Coordination Compounds of Metals Y.A Mazurenko, A.I Gerasimchuk	689
Low-Temperature Solution for Silicon Nitride LPCVD Using Cl-Free Inorganic Trisilylamine N. Tamaoki, Y. Sato, C. Dussarrat, J.-M. Girard, T. Kimura	693

Mechanism of Oxygen Contamination in PECVD a-Si:H Films M. Hiramatsu, Y. Kimura, M. Jyumonji, M. Nishitani, M. Matsumura	701
Growth of Homogeneous and Gradient BC _x N _y Films by PECVD Using Trimethylaminoborane Complex M.L.Kosinova, N.I.Fainer, Yu.M.Rumyantsev, E.A.Maximovski, F.A.Kuznetsov, M.Terauchi, K.Shibata, F.Satoh	708
Plasma Enhanced Chemical Vapor Deposition of Er-Doped Amorphous Silicon Thin Films M.M.Giangregorio, M. Losurdo, P.Capezzuto, G.Bruno	716
Interaction Between Active Plasma and Growing Co-C-O - Layer During PACVD A. Nürnberg, R. Stolle, G. Wahl, K.T. Raic	722
Niobium Nitride Film Growth by Plasma CVD A.Yu, G. Grigori, V. Vajenine.....	730
Chromium and Zirconium Type Layers Produced from Metalorganic Compounds Using the Glow Discharge Conditions J.Sobiecki, T Wierzchon.....	733

VOLUME 2

OXIDE COMPOUNDS

Epitaxial Stabilization in MOCVD of Oxide Thin Films A. Kaul, O. Gorbenko, I. Graboy, M. Novozhilov, A. Bosak, A. Kamenev, S. Antonov, I. Nikulin, A. Mikhailov, M. Kartavtzeva	741
MOCVD of Oxides on Textured Ni for High Temperature Superconducting Tapes O. Stadel, M. Liekefett, J. Schmidt, G. Wahl, O. Gorbenko, A. Kaul.....	749
Magnesium Acetylacetone-Dipivaloylmethanate as a New Precursor for MOCVD of MgO Thin Films O. Kotova, A. Botev, O.Gorbenko, N. Kuzmina, A. Kaul, I. Malkerova, A. Alikhanyan	755
Aluminium Oxide Thin Film Grown by Low Pressure MOCVD Using Aluminium Acetylacetone and Nitrous Oxide M.P. Singh, T. Shripathi, S.A. Shivashankar.....	763

Growth of Al ₂ O ₃ Films by Pulsed Injection MOCVD: Comparative Study of Precursor Materials	
A.Abrutis, A.Bartasyte, V.Kubilius, A.Teiserskis, P.Baumann, J.Lindner, M.Schumacher, C.Dubourdieu	771
Tungsten Doped Vanadium Oxide Thin Films by Atmospheric Pressure Chemical Vapour Deposition	
T. D. Manning, I. P. Parkin.....	777
Parametric Study of the CVD of YSZ from Organometallic Precursors	
V. Varanasi, T. Besmann, R. Hyde, W. Xu, T. Starr.....	783
MOLPCVD of Ta ₂ O ₅ Using TaC ₁₂ H ₃₀ O ₅ N as Precursor for Batch Fabrication	
D. Briand, G. Mondin, S. Jenny, O. Banakh, P. D. van der Wal, S. Jeanneret, H. Keppner, N.F. de Rooj	790
Single Source MOCVD Precursors for RNiO ₃ (R = Rare Earth Metal) Thin Film Deposition	
P.R. Abdyushev, M.A. Novojilov, M.V. Ryazanov, E.A. Bochkov, N.P. Kuzmina, A.R.Kaul, A.N. Gleizes.....	798
Textured SrTiO ₃ Thin Films on SiO ₂ /Si by Liquid Injection MOCVD Using a New Bimetallic Precursor	
S. Lhostis, M. Audier, J-P. Séateur, C. Dubourdieu, L. Auvray.....	806
Infrared Spectroscopic Study on Metalorganic Chemical Vapor Deposition of (Ba, Sr)TiO ₃ Films	
T. Nakamura, T. Nishimura, S. Momose, K. Tachibana	814
Strongly Oriented Thin Films of Er ₂ O ₃ Grown on Fused Quartz by Low-Pressure MOCVD	
M.P. Singh, K. Shalini, S.A. Shivashankar.....	821

HIGH-K MATERIALS

Balancing Reactor Fluid Dynamics and Deposition Kinetics to Achieve Compositional Variation in Combinatorial Chemical Vapor Deposits of ZrO _x , HfO ₂ , and SnO ₂	
W. Gladfelter, B. Xia, F. Chen, S. Campbell, J. Roberts Invited Paper	829

Novel Precursor for High-k Dielectrics and Metal Electrodes Part I: Synthesis J. Atwood, D. Hoth, D. Moreno, C. Hoover, J. Peck, J. Natwora, M. Mosscrop, S. Meiere.....	839
Novel Precursors for High-k Dielectrics and Metal Electrodes Part II: Deposition J. Atwood, D. Hoth, D. Moreno, C. Hoover, S. Meiere, D. Thompson, G. Piotrowski, M. Litwin, J. Peck.....	847
Chemical Vapor Deposition of Zirconium Tin Titanate: A Dielectric Material for Potential Microelectronic Applications E. Mays, D. Hess, W. Rees	855
Hafnium Titanium Silicate High-k Dielectric Films Deposited by MOCVD using Novel Single Source Precursors S. Zuercher, M. Morstein, M. Lemberger, A. Bauer	863
Development of Improved Precursors for the MOCVD of Bismuth Titanate A.C. Jones, P.A. Williams, N.L. Tobin, P.R. Chalker, P. Marshall, P.J. Wright, P.A. Lane, P. Donohue, L.M. Smith, H.O. Davies	871
Effect of Solvent on Growth of Ru and RuO ₂ Films by Liquid Injection MOCVD K. Frohlich, K. Husekova, D. Machajdik, J. Soltys, V. Patoprsty, P. Baumann, J. Lindner, M. Schumacher	879
MOCVD of RuO ₂ Thin Films Using (? ⁶ -benzene)(? ⁴ -1,3-cyclohexadiene)Ru H.-N. Hwang, K.C. Han, K.-S. An, T.-M. Chung, Y. Kim	886
Utilizing MOCVD for High-Quality Zirconium Dioxide Gate Dielectrics in Microelectronics S. Harasek, H. Wanzenboeck, W. Brezna, J. Smoliner, E. Gornik, E. Bertagnolli	894
MOCVD of ZrO ₂ Thin Films from Two Different β -Diketonate Precursors: Dependence of Microstructure and Growth Kinetics on the Precursor M.S. Dharmaprkash, S.A. Shivashankar.....	900
HfO ₂ Films Obtained By Injection MOCVD F. Roussel, H. Roussel, M. Audier, C. Dubourdieu, J.P. Séateur, C. Jiménez, T.J. Leedham, H. O. Davies, A. C. Jones, B.J. O'Sullivan, M. Mondreau, P.K. Hurley, Q. Fang, I. W. Boyd.....	907

MOCVD Growth of Pr₂O₃ High-k Gate Dielectric for Silicon: Synthesis and Structural Investigation

R.L. Nigro, R. Toro, G. Malandrino, V. Rainieri, I. L. Fragalà.....915

CONDUCTING, SEMI CONDUCTING, AND MAGNETIC MATERIALS

Continuous and Granular Metal Films Produced by Chemical Vapor Deposition with Chelate Compound Precursors

V. V. Bakovets.....923

CVD of Transition Metals from Metalorganic Complexes

N. Popovska, A. Schneider, G. Emig, U. Zenneck, C. Topf.....931

Silver Thin Films Deposited by Injection MOCVD

M. Abourida, H. Guillon, C. Jimenez, J.M. Decams, O. Valet,
P. Doppelt,938

Atomic Layer Deposition of Ruthenium from RuCp² and Oxygen: Film Growth and Reaction Mechanism Studies

T. Aaltonen, A. Rahtu, M. Ritala, M. Leskelä.....946

Thin Tungsten and Tungsten Oxide Films Produced by Tungsten Pentacarbonyle Pentaisonitrile in a Remote Plasma Reactor

F. Hamelmann, A. Brechling, A. Aschentrup, U. Heinzmann, P. Jutzi,
J. Sandrock, U. Siemeling.....954

MOCVD of Transparent, p-Type Conducting CuCrO₂ Thin Films Using Acetylacetone Precursors

S. Mahapatra, A.U. Mane, M.S. Dharmaprakash, P.S. Bera, M.S. Hegde,
S.A. Shivashankar.....959

Growth and Formation of Inverse GaP and InP Opals

H.M. Yates, D.E. Whitehead, M.G. Nolan, M.E. Pemble, E. Palacios-Lidon,
S. Rubio, F.J. Meseguer, C. Lopez967

Zinc Amide Compounds as Potential Precursors for the Synthesis of Zinc Nitride

E. Maile, A. Devi, R. Fischer.....975

InP/InGaAs Tunneling-Emitter Bipolar Transistor (TEBT) with a Step-Graded Collector Structure Prepared by MOCVD

C.-Y. Chen, K.-W. Lin, W.-H. Chiou, H.-M. Chuang, J.-Y. Chen, S.-Y Fu,
C.-I Kao, W.-C. Liu982

MOCVD of Thin Mixed-Conducting Films on Porous Ceramic Substrates D. Stiens, G. Wahl, G. Garcia, A. Van Veen, M. Rebeilleau	990
Deposition of Mixed Conducting Oxide Thin Films on Porous Ceramic Substrates V. Faucheux, J.L. Deschanvres, S. Pignard, M. Audier, A. Teiserskis, A. Abrutis, S. Rushworth.....	996
CVD-Grown Thin Films of Tetracyanoethylene-Based Room-Temperature Ferrimagnets H. Casellas, L. Valade, D. De Caro, P. Cassoux, F. Villain, D. Gatteschi.....	1001
Chemical Vapour Deposition of Cobalt for Magnetic Applications N. Deo, J. Montgomery, M. Bain, H. Gamble.....	1008
Chemical Vapor Deposition of Cobalt on Si(100) D. Greve, Q. Zhao, K. Barmak, R. Singanamalla.....	1016
MOCVD Growth Characterization of Cobalt Phosphide Thin Films on InP Substrates D. Barreca, R. Camporese, M. Casarin, N. El Habra, R. Gasparotto, M. Natali, G. Rossetto , E. Tondello, P. Zanella	1024
$(\text{Cu}_x\text{Zn}_{1-x})\text{Fe}_2\text{O}_4$ Ferrimagnetic Films Prepared by Atmospheric MOCVD at 360° C Y. Chang, C. Huang, J. Lin, J. Yang, and Z. Yiu	1032
Niobium and Molybdenum-Based Molecular Magnets Grown as Thin Films by Chemical Vapor Deposition E. Lamouroux, E. Alric, H. Casellas, L. Valade, D. De Caro, M. Etienne, D. Gatteschi.....	1040
 NANOSTRUCTURED MATERIALS	
CVD Growth of Carbon Nanotubes: Catalyst, Growth, and Structure L. Delzeit, I. McAninch, K. Matthews, H.T. Ng, R. Stevens, M.M. Meyya Meyyappan Invited Paper	1047

Synthesis of Carbon Nanotubes on Metallic Substrates by PECVD Thermal CVD D. Park, Y.H. Kim, J.K. Lee	1056
Macroscopic and Microscopic Investigations on the LPCVD Fabrication of Silicon Nanodots on Oxidized Silicon Wafers E. Blanquet, P. Donnadieu, M.-C. Schouler, J.-P. Simon, M. Maret, M. Pons, V. Cocheteau, B. Caussat, E. Scheid, P. Mur, M.-N. Semeria	1064
CVD-Based Preparation Routes of Single-Walled Carbon Nanotubes with Controlled Architectures M.L. Terranova, S. Orlanducci, V. Sessa, S. Botti	1072
Investigation of Nanocrystalline Diamond Films Prepared by Microwave Plasma Chemical Vapor Deposition C. Popov W. Kulisch	1079
Nanocrystalline SiC _x N _y films: RPECVD Synthesis and Transformation Under Thermal Annealing N.I.Fainer, M.L.Kosinova, Yu.M.Rumyantsev, B.M.Ayupov, B.A.Kolesov, F.A.Kuznetsov, A.I.Boronin, C.V.Koscheev, M. Terauchi, K. Shibata, F. Satoh	1086
Plasma Enhanced Chemical Vapour Deposition of AlN Nanolayers G.Beshkov, K.Grigorov, H. Maciel, I.C.Oliveira, St.Georgiev.....	1094
Nano structures of Group-III Nitrides by MOCVD Using Molecular Precursors J. Khanderi, A. Wohlfart, H. Parala, A. Devi, R. A. Fischer	1098
Nanoscale ZnS and CdS Thin Films from Single-Source Molecular Precursors L. Armelao, D. Barreca, G. Bottaro, A. Gasparotto, C. Maragno, C. Sada, T.R. Spalding, E. Tondello	1104
Nanostructured Cerium Dioxide Thin Films by MOCVD: Influence of the Substrate Nature and Processing Parameters G. Malandrino, R. Lo Nigro, R. Toro, I. Fragalà.....	1112
Nanoscale CeO ₂ -ZrO ₂ Thin Films: A Combined Approach by CVD and Sol-Gel Routes L. Armelao, D. Barreca, L. Bigliani, G. Bottaro, A. Gasparotto, E. Tondello	1119

Preparation of Thin Films and Nanoparticles of Zinc Oxide Using Alkylzinc Alkoxides	
W. Cho, K. Sung, K.-S. An, S.S. Lee, C.G. Kim, Y. Kim.....	1123
Nanostructured TiO₂ Films Deposited by MOCVD on Si-Substrates	
U. Backman, A. Auvinen, J. Jokiniemi.....	1131
SAXS/WAXD on Thermally Annealed Nanostructured CVD-Obtained TiO₂ Films	
M. L. Laveeviae, D. Posedel, A. Turkoviae	1138
Ordered Nanostructure Observed in ZnO Films Grown by MOCVD at 320 °C	
Y. Chang, H. Lu, Y. Hung, C. Lee, J. Qiu, and X. Li.....	1146
Pure and Lu(III)-Doped Nanocrystalline ZnO Films by CVD	
D. Barreca, G.A. Battiston, D. Berto, A. Convertino, A. Gasparotto, R. Gerbasi, E. Tondello, S. Viticoli	1153
Photothermal Aerosol Synthesis of and Photoluminescence from Silicon Nanoparticles	
X. Li, Y. He, M. Swihart.....	1161
MOCVD of Nanocrystalline Fe₂O₃-ZrO₂ and Fe₂O₃-Y₂O₃-ZrO₂ Thin Films	
G. A. Battiston, R. Gerbasi, D. Berto, D. Barreca, E. Tondello	1168
Lead Containing Perovskite Films and Superlattices Grown by MOCVD in Self-Tuning Mode	
A. Bosak, O. Gorbenko, A. Kaul, I. Graboy N. Mirin, S. Gudenko, C. Dubourdieu, J.-P. Sénameur.....	1174
Polycrystalline Copper Nanowires and Networks with 100-Nanometer Radius Observed in MOCVD	
Y. Chang, Y. Chen, R. Wu, K. Chen, J. Lin	1182
Microcoiled Carbon Fibers Formed by Using Ni-Cu Catalysts in CVD Process	
X. Chen, K. Takeuchi, S. Yang, Y. Hishikawa, and S. Motojima.....	1190
Vapor Phase Preparation of Carbon Microcoils/Nanocoils Under Concerted Amplification of Magnetic Field Their Properties	
S. Motojima, K. Kuzuya, S. Yang, X. Chen, T. Hashishin, H. Iwanaga, S. Shimada, H. Saito, N. Yoshikawa, T. Awaji, K. Watanabe	1198

Carbon Micro/Nanocoils Produced by Using WS ₂ Catalyst in CVD Process S. Yang, X. Chen, S. Motojima	1206
---	------

DIFFUSION BARRIERS AND CVD OF COPPER

Thermodynamic and Experimental Approaches of Barrier Materials Synthesis for Silicon IC Technology E. Blanquet, B. Chenevier, E. Ramberg, C. Bernard, R. Madar Keynote Speaker	1212
Deposition and Treatment of Titanium Based Barrier Layers by MOCVD R. Ecke, S.E. Schulz, T. Gessner, S. Riedel, E. Lipp, M. Eizenberg.....	1224
Nitrogen-Free Cu Barrier SiOCH Film with k = 4.3 Y. Nishimoto, Y. Shioya, H. Shimoda, T. Ohdaira, R. Suzuki, K. Maeda.....	1231
Cu Barrier Property of Low-K SiOCH Film with k = 3.5 Deposited by PE-CVD Using HMDSO and N ₂ O Gases Y. Shioya, Y. Nishimoto, T. Ohdaira, R. Suzuki, K. Maeda.....	1239
MOCVD of CrSi _x C _y Thin Films: Study of Their Potentiality as Diffusion Barrier F.D. Duminica, F. Maury.....	1247
Cr ₃ (C,N) ₂ Thin Films Grown by MOCVD as Barrier Against Copper Diffusion C. Gasquères, F. Maury	1255
Growth and Characterization of Ti-Al-N Films Prepared by Plasma-Enhanced Atomic Layer Deposition of TiN and AlN Y.J. Lee, S.-W. Kang	1262
Structural Comparison Between Cu(hfac)(VTMS) and Cu(hfac)(MHY): An Answer to Differences in Copper Film Deposition M. Joulaud, L. Omnes, T. Mourier, D. Mayer, P. Doppelt.....	1268
MOCVD of Copper Films From Bis(ethyl-3-oxo-butanoato)copper(II): Experiment and Thermodynamic Analysis S. Mukhopadhyay, K. Shalini, A. Devi, S.A. Shivashankar.....	1275

Preparation of Cu Thin Films by MOCVD Using Novel Organometallic Cu(II) Precursors	
C.G. Kim, J.W. Park, T.-M. Chung, S.S. Lee, Y. Kim.....	1284
Low Temperature Cu Thin Film Growth Using Cycles of Alternate Supply of (HFAC)Cu(I)(DMB) and Ar Purge Gas	
K. Kim K. Yong.....	1290
Thin Copper Films Prepared by CVD from (HFA)Cu (1.5-COD)	
A. Panin, A. Shugurov, T. Liskovskaya, I. Igumenov, I. Ivonin, K. Oskomov	1297
Copper Dots Deposition Using New Precuresors [Cu ^I (hfac)] ₂ (DVTMSO) and [Cu ^I (hfac)] ₂ (HD)	
S.-W. Kang, J.-H. Yun, S.-W. Rhee, V. Krisyuk, A. Turgambaeva.....	1305
Copper Film Deposition with Cu(dpm) ₂ Precursor	
V. V. Bakovets, T. M. Levashova, I. P. Dolgovesova, E. A. Maximovski.....	1313
Comparative Study of Cu-Precursors for 3D Focused Electron Beam Induced Deposition	
A. Luisier, I. Utke, T. Bret, F. Cicoira, R. Hauert, S.-W. Rhee, P. Doppelt, P. Hoffmann.....	1318

DEVELOPMENT OF NEW MATERIALS AND ALTERNATIVE PROCESSING METHODS FOR EXISTING MATERIALS

Hard Materials

MOCVD of Ir-Al ₂ O ₃ Protective Coatings	
I.K. Igumenov, N.V. Gelfond, N.B. Morozova, P.P. Semyannikov, S.V.T. Trubin, V.S. Danilovich, L. Gimeno-Fabra	1327
Investigation of Chemical Vapor Deposition Processes to Perform Dense α -Alumina Coating on Superalloys	
N. Bahlawane, S. Blittersdorf, K. Kohse-Höinghaus, B. Atakan, J. Müller	1335
Diamond Nucleation on Silicon Using an Intermediate Temperature Step	
L. Dumitrescu- Buorn, E. Blank.....	1343

Growth of ECR-CVD Carbon Nitride Films With a High Nitrogen Content from CH ₄ /N ₂ /Ar Mixtures M.Camero, C. Gómez-Aleixandre, J. M Albella	1351
Electronic Materials	
Growth of Si and Ge Quantum Dots on Insulators by LPCVD T. Baron, F. Mazen, I. Perniola, B. Pelissier, J.M.Hartmann, J.F. Damlencourt	1357
Fabrication Characteristics of Midgap Metal Gates Compatible With Thin SiO ₂ Films Using Low Pressure Chemically Vapor Deposited Tungsten Films D.N. Kouvatsos, V. Ioannou-Souglaridis, S. Tsevas, D. Davazoglou, F. Christoforou, C. Boukouras	1364
Low Pressure Chemical Vapor Deposition of Silicon Nitride Using Mono- and Disilylamine C. Dussarrat, J.-M. Girard, T. Kimura, N. Tamaoki, Y. Sato	1372
Very Thin (<10nm) Silicon Oxynitride (SiO _x N _y) Layers Formed by PECVD R.B. Beck, M. Cuch, A. Wojtkiewicz, A. Kudla, A. Jakubowski	1380
Titanium Phosphide Coatings From the Atmospheric Pressure CVD Reaction of TiCl ₄ with PR _x H _{3-x} (R = cy ^{hex} ; or R = SiMe ₃ where x = 3) C. Blackman, C. Carmalt, S. O'Neill, I. Parkin, K. Molloy, L. Apostolico.....	1387
An n ⁺ -InGaAs/n-GaAs Dual-Doped-Channel Heterostructure Field-Effect Transistor (DDC-HFET) Grown by LP-MOCVD H.-M. Chuang, K.-W. Lin, K.-H. Yu, C.-Y. Chen, J.-Y. Chen,P.-H Lai, C.-I. Kao,W.-C. Liu	1395
Study of Deposition Processes in PZT Films Grown by Liquid Delivery MOCVD M. Kurasawa, M. Nakabayashi, K. Nakamura, K. Maruyama, T. Eshita, K. Kurihara	1403
Effect of Solvent on the Deposition Behavior of MOCVD-Pb(Zr,Ti)O ₃ Films Using Liquid-Deliver Source Supply System H. Funakubo, G. Asano, T. Ozeki, H. Machida, T. Yoneyama, Y. Takamatsu	1411

Deposition of Yttrium or Lanthanum-Substituted Bismuth Titanate Films by Direct Liquid Injection-Metal Organic Chemical Vapor Deposition for Use in Non-Volatile Memories

S.-W. Kang, S.-W. Rhee 1419

Tin Phosphide Coatings from the Atmospheric Pressure Chemical Vapour Deposition of SnCl_4 and $\text{Pcyc}^{\text{hex}}_x \text{H}_{3-x}$

R. Binions, C. J. Carmalt, I. P. Parkin 1426

Optical Thin Film Coatings of CVD Molybdenum Oxides and Investigations of Their Electrochromic Properties

T. Ivanova, K.A. Gesheva 1434

Electrochromic Materials

Fabrication of Electrochromic Displays by Chemically Vapor Depositing Patterning WO_3 Films on $\text{SnO}_2:\text{F}$ Covered Glass Substrates

M. Vassilopoulou, D. Pappas, I. Raptis, D. Davazoglou I. Kostis 1442

Characterization of Vanadium Oxide Films Prepared by Atmospheric Pressure Chemical Vapour Deposition

D. Vernardou, M.E. Pemble, D. Sheel, T.D. M Ivan, P. Parkin 1448

Catalytic Materials

Chemical Vapor Deposition of Co_3O_4 on Honeycomb Substrates for Catalytic Applications

E. Fischer Rivera, B. Atakan, K. Kohse-Hoinghaus
Keynote Speaker 1455

Preparation of Pd/Zn/ZnO Catalysts for Methanol Steam Reforming by MOCVD

N. Popovska, F. Kießlich, G. Emig 1463

Sub-Estoquimetric Titania Layers Prepared by MOCVD for Photocatalysis Applications

I. Justicia, G. Garcia, G.A. Battiston, R. Gerbasi, A. Figueras,
D. Dorignac 1471

MOCVD of TiO_2 Thin Films Using a New Class of Metalorganic Precursors

R. Bhakta, U. Patil A. Devi 1477

Polycrystalline Spinel Chromite $ZnCr_2O_4$ Films Prepared by MOCVD Y. Chang, H. Pen, C. Chung	1484
A Study on (311) $CuCr_2O_4$ Spinel Films Prepared by MOCVD Y. Chang, C. Lin, and B. Lee.....	1492
Comparative Study of MOCVD Platinum Thin films Obtained by the Use of Liquid Injection System or Conventional Bubbler O. Valet, P. Doppelt, P.K. Baumann, M. Schumacher, F.C. Beuran, H. Guillon	1500
High Temperature Superconductors	
New Yttrium Precursors for YBCO Films Prepared by PI-MOCVD J. Terrematte, S. Daniele, L.G. Hubert-Pfalzgraf, J. M. Decams, S. Le Gall, H. Guillon, S. Beauquis, P.H. Ng, C. Jimenez, F. Weiss.....	1508
Novel Compounds for use as TiO_2 Precursors in Thin Film Deposition by Liquid Injection MOCVD C. L. Clarke, N. M. Boag, M. E. Pemble.....	1514
Buffer Layers and YBCO Growth on Ni Rabbit Tapes S. Donet, F. Weiss, P. Chaudouet	1522
PI-MOCVD Original Buffer Layers for $YBa_2Cu_3O_{7-\delta}$ Coated Conductors S. Beauquis, S. Donet, F. Weiss, H. Roussel, A. Abrutis	1528
CVD Of Thin Oxygen Permeable Membrane Films R. Muydinov, M. Novojilov, O. Gorbenko, I. Korsakov, A. Kaul, D. Stiens, S. Samoilenkov, G. Wahl.....	1540
Preparation Of Tl-1223 Superconducting Films With High Transport J_c by Spray Pyrolysis S. Phok, Ph. Galez, J.L. Jorda, D. De Barros, F. Weiss, C. Peroz, C. Villard.....	1547
Subject Index	1555
Author Index	1561