Microelectronics Technology and Devices – SBMICRO 2007

Editors:

J. A. Martino
PSI/USP
São Paulo, SP, Brazil

M. A. Pavanello
Centro Universitário da FEI
São Bernardo do Campo, SP, Brazil

C. Claeys
IMEC
Leuven, Belgium

Sponsoring Division:

Electronics and Photonics

Published by
The Electrochemical Society
65 South Main Street, Building D
Pennington, NJ 08534-2839, USA
tel 609 737 1902
fax 609 737 2743
www.electrochem.org

ecs transactions ™

Vol. 9 No. 1

Copyright 2007 by The Electrochemical Society, Inc.
All rights reserved.

This book has been registered with Copyright Clearance Center, Inc.
For further information, please contact the Copyright Clearance Center,
Salem, Massachusetts.

Published by:

The Electrochemical Society, Inc.
65 South Main Street
Pennington, New Jersey 08534-2839, USA

Telephone 609.737.1902
Fax 609.737.2743
e-mail: ecs@electrochem.org
Web: www.electrochem.org

ISSN 1938-6737 (online)
ISSN 1938-5862 (print)

ISBN 978-1-56677-565-6

Printed in the United States of America

***ECS Transactions*, Volume 9, Issue 1**
Microelectonics Technology and Devices SBMICRO 2007

Table of Contents

Preface iii

Chapter 1
Multiple Gates

Multiple Gates for SOI MOSFETs : Two, Three or Four? ***** 3
S. Cristoloveanu

Triple Gate FinFET Parameter Extraction Using High Frequency Capacitance - Voltage Curves 9
M. Rodrigues, V. Sonnenberg and J. A. Martino

Low Temperature Operation of Undoped Body Triple-Gate FinFETs from an Analog Perspective 19
M. A. Pavanello, J. A. Martino, E. Simoen, R. Rooyackers, N. Collaert and C. Claeys

Influence of the N-Type FinFET Width on the Zero Temperature Coefficient 29
M. Bellodi, J. A. Martino, L. M. Camillo, E. Simoen and C. Claeys

Sidewall Angle Influence on the FinFET Analog Parameters 37
R. Giacomini, J. A. Martino and M. A. Pavanello

Improved Compact Model for Symmetric Doped Double-Gate MOSFETs 47
A. Cerdeira, B. Iniguez and M. Estrada

The Coherent FinFET 57
C. R. Da Cunha

Distortion Analysis of Triple-Gate Transistor in Saturation 67
J. E. Conde, A. Cereira and M. Estrada

On the Threshold Voltage of Undoped Double-Gate SOI MOSFETs 75
F. J. Garcia-Sanchez, A. Ortiz-Conde, J. Muci and R. Salazar

Chapter 2
Thin Films and Processes

Semiconductor Surface Cleaning and Conditioning Challenges Beyond Planar Silicon Technology ***** 87
J. Ruzyllo

Advanced ESD Protection Solutions in CMOS/BiCMOS Technologies ***** 97
J. J. Liou, J. A. Salcedo and Z. Liu

Ultra-Thin Deformable Silicon Substrates with Lateral Segmentation and Flexible Metal Interconnect 103
T. Zoumpoulidis, L. Wang, M. Bartek, K. Jansen and L. J. Ernst

Stress Analysis on Ultra Thin Ground Wafers 113
R. C. Teixeira, K. De Munck, P. De Moor, K. Baert, B. Swinnen, C. Van Hoof and A. Kuttel

Anisotropic Resistivity of PMMA Doped with Gold 123
F. S. Teixeira, R. D. Mansano, M. C. Salvadori, M. Cattani and I. G. Brown

A Gravimetric Technique to Determine the Crystallite Size Distribution in High Porosity Nanoporous Silicon 133
M. du Plessis

The Effect of Si-Substrate on the Optical Characterization of Ge Nanostructures Obtained by LPCVD 143
S. N. Mestanza, E. Rodriquez, I. Doi, A. R. Vaz and N. C. Frateschi

Dynamic Scaling of the Surface Roughness During Electroless Cu Plating onto Si in Aqueous Fluoride Solution 151
G. Gozzi and G. dos Santos Flho

ECR-CVD SiNX Passivation in GaAs-based MISFET Devices 159
L. B. Zoccal, J. A. Diniz, J. G. Fo, A. Daltrini and J. W. Swart

GaAs and AlGaAs reactive ion etching in SiCl4/Ar gas mixtures for HEMT applications 169
A. M. Nunes, S. A. Moshkalev, P. J. Tatsch, C. A. Duarte and G. M. Gusev

Design of Finish Process of Freeform Surface in Magnetic-Assistance Electrochemical Finishing 179
P. S. Pa

Effect of the Substrate Heating Due to the Sputtering Process on the Crystallinity of TiO2 Thin Films 189
H. Toku, R. S. Pessoa, T. B. Liberato, M. Massi, H. S. Maciel and A. S. da Silva Sobrinho

Electroless Deposition of CuNiP Alloys onto Silicon Surfaces 199
F. T. Parra, S. G. dos Santos Filho, A. E. Marques and S. Martini

Improvement of Polymeric Electroluminescent Device Structures Through Simulation of UV-Vis Absorption Spectra of PANI/PVS Films 207
J. P. Lima and A. M. de Andrade

Contact Improvement for Carbon Nanotubes Deposited by Dielectrophoresis 213
J. Leon, A. R. Vaz, A. Flacker, S. A. Moshkalev, M. B. de Moraes and J. W. Swart

The Influence of Substrates on the Carbon Nanotube Growth Process 219
M. R. de Aguiar, C. Verissimo, S. A. Moshkalev and J. W. Swart

Etching Studies of Post-Annealed SiC Films Deposited by PECVD: Influence of the Oxygen Concentration 227
M. A. Fraga, R. S. Pessoa, M. Massi, H. S. Maciel and S. G. dos Santos Filho

Electrical Characterization of Platinum Thin Films Deposited by Focused Ion Beam 235
M. M. da Silva, A. R. Vaz, S. A. Moshkalev and J. W. Swart

Novel Europium β-diketonate Complex in Organic Light Emitting Diode: Eu(BTA)3bipy [tris(1-(2-benzoyl)-3,3,3-trifluoroacetone))-bipyridine, Europium(III)] 243
G. Santos, F. J. Fonseca, A. M. Andrade, S. S. Braga, A. C. Coelho, I. S. Goncalves, W. Simoes and L. Pereira

Deposition and Characterization of Indium-Tin Oxide Thin Films Deposited by RF Sputtering 251
L. R. Damiani and R. D. Mansano

Electrical Characterization of a-C:H as Insulator Material in MIM Structures 259
C. Zuniga-I, A. I. Kosarev, A. Torres-J, C. Reyes-Betanzo, W. Calleja-A and P. Rosales

Clusters Formation by Rapid Thermal Annealing on SiO2/Ge and SiH/Ge Heterostructures 269
A. M. dos Anjos, J. A. Diniz, L. B. Zoccal, U. A. Mengui, M. A. Canesqui and I. Doi

Chapter 3
Characterization and Modeling

Physical Characterization and Reliability Aspects of MuGFETs ***** 281
C. Claeys, E. Simoen, J. M. Rafi, M. A. Pavanello and J. A. Martino

Electromigration Modeling for Interconnect Structures in Microelectronics ***** 295
H. Ceric and S. Selberherr

The Impact of the Gate Oxide Thickness Reduction on the Gate Induced Floating Body Effect in SOI nMOSFETs 305
P. G. Der Agopian, J. A. Martino, E. Simoen and C. Claeys

A Study Of Flicker Noise In MOS Transistor Under Switched Bias Condition 313
M. Miguez and A. Arnaud

Analysis of Matching in Graded-Channel SOI MOSFETs 323
M. de Souza, D. Flandre and M. A. Pavanello

Fundamentals, Computer Implementation and Applications of the Advanced Compact MOSFET (ACM) Model 333
O. F. Siebel, M. C. Schneider and C. Galup-Montoro

Improved Model to Determine the Generation Lifetime in Double Gate SOI nMOSFETs 343
M. Galeti, J. A. Martino, E. Simoen and C. Claeys

Electrical Studies on Metal /SrTa2O6 or TiO2/ Si Substrate Stack Systems 353
O. O. Awadelkarim, J. Jiang, S. A. Suliman, K. Sarpatwari, L. J. Passmore, D. Lee, P. Roman and J. Ruzyllo

Modeling Negative Differential Resistance (NDR) Devices using Radial Basis Function Neural Networks 363
M. C. Banderia, J. G. Guimaraes, J. A. Duraes, L. M. Silva, A. M. Ceschin, M. J. Sales and J. C. Costa

The Length-Dependence of the 1/f Noise of Graded-Channel SOI nMOSFETs 373
E. Simoen, C. Claeys, T. M. Chung, D. Flandre and J. Raskin

Reversible Electrical Characteristics in PMMA on P3HT OTFTs 383
I. Mejia, M. Estrada, A. Cerdeira and B. Iniguez

A New Method for Polynomial Coefficient Extraction Applied to Harmonic Distortion Calculation 389
A. Ortiz-Conde, F. J. Garcia-Sanchez and R. Salazar

Study of the Drain Leakage Current Behavior in Circular Gate SOI nMOSFET Using 0.13μm SOI CMOS Technology at High Temperatures 397
L. M. Almeida and M. Bellodi

10 GHz RF Passive Components Obtained by MCM-D Technology 405
L. B. Zoccal, C. M. Cabreira, S. D. Yamamoto, R. A. Flacker, E. A. Gomes, J. A. Diniz and J. W. Swart

Three-Dimensional (3-D) Electro-Thermal Simulation of Four-Layer Devices 415
R. Quientero-Romo

Coupled Quantum Dot Cell Dynamics 423
M. F. Stella, M. V. Batistuta and J. C. da Costa

Stability of Coupled Quantum Dot Cells at Finite Temperatures 433
M. V. Batistuta, M. F. Stella and J. C. da Costa

Impact of Graded-Channel SOI MOSFET Application on the Performance of Cascode and Wilson Current Mirrors 441
A. A. Santos, D. Flandre and M. A. Pavanello

Improved Charge Sheet Model for PD SOI Sub-Micron MOSFETs 451
J. Alvarado, A. Cerdeira, V. Kilchytska and D. Flandre

Study of MOS Capacitors with Annealed TiO2 Gate Dielectric Layer 461
K. F. Albertin, M. A. Valle and I. Pereyra

Chapter 4
MEMS

Silicon Microtips with Self-Asligned Integrated Electrodes 473
A. L. Barros, A. T. Lopes and M. N. Carreno

Silicon Microtips Arrays Fabricated by HI-PS Technique for Application in Field Emission Devices 481
M. O. Dantas, M. M. Kopelvski, E. Galeazzo, H. E. Peres and J. R. Fernandez

Simple MEMS-based Incandescent Microlamps 489
G. Rehder, M. N. Carreno and M. I. Alayo

Simulation, Fabrication and Characterization of a Tunable Bragg Reflector Based on Silicon Oxide and Silicon Nitride Dielectric Films Deposited by PECVD 497
G. S. Martins, H. Baez and M. I. Alayo

Microstructural and Electrical Conductivity Relationships in Alumina-Containing Yttria Stabilized Cubic Zirconia Used as a Solid Electrolyte in Solid Oxide Fuel Cells 505
S. Tekeli, A. Kayis, O. Gurdal and M. Guru

Precision Recycle Process of ITO Removal from Color Filter Using Electrochemical Machining 515
P. S. Pa

Effect of Number of Layers on the Optical Response of Porous Silicon Bragg's Mirrors 525
D. R. Huanca and W. J. Salcedo

Chapter 5
Sensors and Actuators

Study of Nickel Silicide as Mask for Alkaline Solutions to V-grooves Fabrication 533
A. R. Mascaro, L. C. Goncalves and N. I. Mortimoto

Zinc-Oxide Surface Acoustic Wave Device Fabrication 539
E. J. Santos and A. M. Santos

Influence of the Interferers in the Nitrite Detection By using Planar Electrochemical Sensors 545
F. L. Ameida and M. B. Fontes

Photoresponse Analysis of Sensors Fabricated with Standard 2.0 µm CMOS Technology 553
D. R. Huanca, E. Rodriquez, I. Doi, J. A. Diniz, J. W. Swart and N. C. Frateschi

A Theoretical Study of a Novel Multi-Terminal Pressure Sensor Based on the Transversal Piezoresistive Effect 561
G. Coraucci and F. Fruett

Characterizaton of a Isfet Device as a pH Sensor for Application in the Industrial, Environmental and Biomedical Fields 571
R. Scaff, M. B. Fontes and S. G. dos Santos Filho

Macroporous Silicon Structure Functionalized by Methylene Blue to pH Measurements Application 579
D. S. Raimundo, G. S. Cechelero, A. Acosta, F. R. Fernandez and W. J. Salcedo

Characterization of a P3HT- Si Heterojuntion for Solar Cells Applications 587
J. C. Nolasco, M. Estrada, Y. Matsumoto, L. F. Marsal and J. Pallares

Subject Index 595

Author Index 597

***** *Invited Papers*