# TABLE OF CONTENTS

**Preface** ................................................................. xi

**Materials Research Society Symposium Proceedings** ...................... xii

**PART I: AMORPHOUS AND POLYSILICON TFT MATERIALS**

*Hybrid Amorphous and Polycrystalline Silicon Devices for Large-Area Electronics* ........................................ 3


**α-Si:H Thin-Film Transistors on Rollable 25-μm Thick Steel Foil** 13

E.Y. Ma and S. Wagner

**Reaction Processes for Low Temperature (<150°C) Plasma Enhanced Deposition of Hydrogenated Amorphous Silicon Thin-Film Transistors on Transparent Plastic Substrates** 19

Gregory N. Parsons, Chien-Sheng Yang, Tonya M. Klein, and Laura Smith

**Stepped Gate Polysilicon Thin-Film Transistor for Large Area Power Applications** 25

J. Aschenbeck, Y. Chen, F. Clough, Y.Z. Xu, E.M. Sankara Narayanan, and W.I. Milne

**Transistors With a Profiled Active Layer Made by Hot-Wire CVD** 31

H. Meiling, A.M. Brockhoff, J.R. Rath, and R.E.I. Schropp

*High Conductivity Gate Metallurgy for TFT/LCD's* ..................... 37


*Recent Progress of Low Temperature Poly Si TFT Technology* ....... 47

Kiyoshi Yoneda

*Grain Engineering Approaches for High-Performance Polysilicon Thin-Film Transistor Fabrication* .............................. 55

O.K. Guist and T.W. Sigmon

**Co-Optimization of Si Thin-Film Deposition and Excimer Laser Anneal Processes for Fabrication of High-Performance p-Si TFTs** 67

A.T. Voutsas, A. Marmorstein, and R. Sojani

**α-Si:H TFTs Made on Polyimide Foil by PE-CVD at 150°C** .......... 73

H. Gieskova, S. Wagner, and Z. Suo

*Invited Paper*
Electrical Test Sites for AMLCD-TFT Array Process
Characterization ................................................................. 79
E.G. Colgan, R.J. Polastre, M. Takeichi, and R.L. Wisnieff

Passivation of Poly-Si Thin-Film Transistors With
Ion-Implanted Deuterium ................................................... 85
Albert W. Wang and Krishna C. Saraswat

Correlation of Performance and Hot Carrier Stress Reliability
of Polycrystalline Silicon Thin-Film Transistors With Substrates
and Substrate Coating ......................................................... 91
Y.Z. Wang and O.O. Awadelkarim

Structural Investigations of Laser-Crystallized Hydrogenated
Amorphous Silicon ............................................................. 97
D. Toet, P.M. Smith, T.W. Signon, R. Qiu, T. Takehara, S. Sun,
C.C. Tsai, and W.R. Harshbarger

New Excimer Laser Crystallization in the Lattice Shape to
Improve the Uniformity of Electrical Characteristics of
Poly-Si TFT ........................................................................... 103
Jae-Hong Jeon, Cheol-Min Park, Kee-Chan Park, Min-Cheol Lee,
and Min-Koo Han

Low-Temperature PECVD Polysilicon Crystallization by
Rapid Thermal Processing ..................................................... 109
Mark Stewart, Howard Hovagimian, Jecko Arakkal, Sambit Saha,
and Miltiadis K. Halalis

A Dehydrogenation and Annealing Method of a-Si by
Microwave .............................................................................. 115
C-M. Park, J-H. Jeon, C-H. Kim, and M-K. Han

Low-Temperature, High-Quality Silicon Dioxide Thin Films
Deposited Using Tetramethylsilane (TMS) ............................... 121
D.M. Reber and S.J. Fonash

Reflective Infrared Spectra of PECVD Thin Films on Glass
Substrate ................................................................................. 127
Shusheng He

Substrate Surface Morphology and Growth Evolution of
Low Temperature Silicon Nitride on Transparent Plastics ....... 133
L.L. Smith, C.B. Arthur, C.S. Yang, and G.N. Parsons

Thin-Film Transistors Fabricated With Poly-Si Films
Crystallized by Microwave Annealing .................................... 139
Yong Woo Choi, Jeong Ho Lee, Tae Woong Jang, and
Byung Tae Ahn

μc-Si:H Thin-Film Devices for Optical Image Recognition ........... 145
A. Maçarico, M. Fernandes, J. Martins, and M. Vieira
Low-Temperature Formation of SiN_x Gate Insulator for Thin-Film Transistor Using CAT-CVD Method ........................................ 151
A. Izumi, T. Ichise, and H. Matsumura

Low-Temperature Floating Plasma Oxidation of Poly-SiGe .................. 157
Zhineng Fan, Gang Zhao, Paul K. Chu, Zhonghe Jin, Hol S. Kwok, and Man Wong

Effect of Ni and Al on the Low-Temperature Field Aided Lateral Crystallization (FALC) ............................................................... 161
Sang-Hyun Park, Seung-Ik Jun, Chan-Jae Lee, Yong-Ho Yang, and Duck-Ryun Choi

Controlling the Amount of Si-OH Bonds for the Formation of High-Quality Low-Temperature Gate Oxides for Poly-Si TFTs .......... 167
Katsuhisa Yuda, Hiroshi Tanabe, Kenji Sera, and Fujio Okumura

PART II: FIELD EMISSION CATHODES AND DISPLAYS

Development of Field Emission Flat Panel Displays at Motorola .......... 175
A.A. Talin, B. Chalamala, B.P. Coll, J.E. Jaskie, R. Petersen, and L. Dworsky

Chimney-Shaped and Plateau-Shaped Gate Electrode Field Emission Arrays ................................................................. 179
F.Q. Tarntair, C.C. Wang, W.K. Hong, H.K. Huang, and H.C. Cheng

Mechanism of Field Emission in Diamond and Diamond-Like Carbon ................................................................. 185
J. Robertson

Relationship of Field Emission Characteristics on Process Gas Nitrogen Content in Nitrogen Doped Diamond Films .................. 191
A.T. Sowers, B.L. Ward, and R.J. Nemanich

Characterization of Tetrahedrally Bonded Amorphous Carbon Via Capacitance Techniques ..................................................... 197
Kimon C. Palinginis, A. Ile, B. Kleinsorge, W.I. Milne, and J.D. Cohen

Role of RF Power and Gas Mixture in Some Optical and Photoluminescence Properties of Dual-Plasma a-C:H Films ........ 203
T. Heitz, C. Godet, J.E. Bouree, B. Drevillon, V. Chu, J.F. Conde, and C. Clerc

PART III: OTHER NOVEL DISPLAYS, MATERIALS, AND PROCESSES

All Printed Bistable Reflective Displays: Printable Electrophoretic Ink and All Printed Metal-Insulator-Metal Diodes ................. 211
Jaeyong Park and Joseph M. Jacobson

*Invited Paper
A Bistable Membrane Approach to Micromachined Displays  ........................................ 219

J.G. Fleming

Novel Dichroic Polarizing Materials and Approaches to Large-Area Processing  .......................... 225

Yuri A. Bobrov, Sean M. Casey, Leonid Y. Ignatov, Pavel I. Lazarev, Daniel Phillips, and Suk-Wah Tam-Chang

Effects of Ultraviolet-Light on Polyimide Films for Liquid Crystal Alignment  ...................... 229

Shaoqin Gong, Jerzy Kanicki, Lan Ma, and John Z.Z. Zhong

Structure of Ions in Liquid-Crystalline Materials  ................................................................. 235

Shohei Nagamura, Yuji Nakazono, Kenichi Nishikawa, Atsushi Sawada, Peer Kirsch, Matthias Bremer, and Kazuaki Tarumi

High Sensitivity Polymer Photosensors for Image Sensing Applications  ................................ 241

Gang Yu, Jian Wang, Jon McElvain, and Alan J. Heeger

*Electroluminescent Displays  .................................................. 247

Christopher N. King

PART IV: PHOSPHOR MATERIALS

Electron Beam Degradation of Sulfide-Based Thin-Film Phosphors for Field Emission Flat Panel Displays  .................................................. 261

B.L. Abrams, T.A. Trottier, H.C. Swart, E. Lambers, and P.H. Holloway

Low-Voltage Cathodoluminescent Properties of Blue-Emitting Yttrium Silicates Doped With Cerium  ............................................................................. 269


Synthesis and Characterization of Luminescent ZnO Powders Produced by Thermally-Induced Doping  .................................................. 275

B. Allieri, L.E. Depero, L. Sangaletti, L. Antonini, and M. Bettinelli

Luminescence Properties of Thin-Film SrS:Cu Phosphors for Electroluminescent Displays  .......... 281

T.C. Jones, W. Park, E. Mohammed, B.K. Wagner, C.J. Summers, and S.S. Sun

Production of Strontium Sulfide Coatings by Metal Organic Chemical Vapor Deposition  .......... 289

T.S. Moss, R.C. Dye, and R.T. Tuenge

Advances in the Growth of SrS Thin Films by Pulsed Laser Deposition  ................................ 295


*Invited Paper
Enhanced Luminescence Properties of Pulsed Laser-Deposited Eu:Y$_2$O$_3$ Thin Film Phosphors Using Diamond Buffer Layer


PART V: CONDUCTORS

Systematic Study of Transparent Conductors in the (Zinc, Gallium)-Indium-Tin Oxide Systems

George B. Palmer, Kenneth R. Poeppelmeier, Doreen D. Edwards, and Thomas O. Mason

Characterization of Transparent Conductors in Indium Zinc Oxide and Their Application to Thin-Film Transistor Liquid-Crystal Displays

M. Takatsuji, T. Hiromori, K. Tsujimoto, S. Tsuji, K. Kuroda, and M. Saka

Cobalt and Nickel for Improved Aluminum-Indium Tin Oxide Contact Metallurgy in Polysilicon TFT Display Applications

Robert S. Howell, Sambit K. Saha, and Miltiadis K. Hatalis

Al-RE-TM (RE = Rare-Earth Metals, TM = Transition Metals) Ternary Alloy Films for TFT-LCD Electrodes

Shinji Takayama

Hillock Formation and Reduction Using Metal Interlayers for Active Matrix Display Applications

Sambit K. Saha, Robert S. Howell, and Miltiadis K. Hatalis

Author Index

Subject Index
PREFACE

This proceedings is the continuation of a series that began at the 1994 MRS Spring Meeting, and focuses on materials and processing issues in flat-panel display technology. During the past few years, tremendous growth and interest in flat-panel display technology has continued, and the diversity of this expanding technology is reflected in this and other MRS proceedings volumes. During the 1998 MRS Spring Meeting, for example, two additional MRS symposia, ‘Materials Issues in Vacuum Microelectronics,’ and ‘Science and Technology of Organic Electroluminescent Devices,’ grew out of the original 1994 MRS effort to highlight research issues in display materials. Heightened activity in field-emission displays was obvious in a joint session on flat-panel display materials and vacuum microelectronics. Papers from that joint session are presented in Section II of this volume and concurrently in the vacuum microelectronics proceedings volume.

A continued strong area of interest and research activity in display technology is active matrix thin-film transistor materials and processing. A substantial part of this volume (Section I) addresses those issues. With the maturing of amorphous silicon thin-film transistor technology, and the continuing proliferation of active matrix LCDs in laptop and desktop computers, more research is focusing on the higher drive-current capabilities of polycrystalline silicon materials. However, there is substantial interest in advances in amorphous silicon technology, as is evident in the series of papers in Section I from a joint session with the ‘Amorphous Silicon Technology’ symposium. Laser crystallization of silicon is beginning to move into manufacturing, and a number of papers, also in Section I, discuss issues ranging from materials fundamentals to practical problems in scaled-up manufacturing of laser crystallized polysilicon.

The advancement of display technology is inspiring creative alternatives to more traditional LCD, EL, and FED materials and processing approaches, and a sampling of some of these is presented in Section III. Phosphor materials pose challenging problems for field-emission and electroluminescent displays. Critical phosphor research and display manufacturing issues are discussed in Section IV of this volume.

The editors of this proceedings thank the supporters of the symposium, including Candescant Technologies, Applied Komatsu Technology, Corning Inc., Sharp Microelectronics, and the Materials Research Society.

Gregory N. Parsons
Chuang-Chuang Tsai
Theodore Fahlen
Carleton Seager

July 1998
MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS


Prior Materials Research Society Symposium Proceedings available by contacting Materials Research Society