CONTENTS

Preface .................................................................................................................................ix

Materials Research Society Symposium Proceedings.........................................................x

POLISHING, CONDITIONING AND WEAR MECHANISMS ON THE PAD

Optimizing Pad Groove Design and Polishing Kinematics for Reduced Shear Force, Low Force Fluctuation and Optimum Removal Rate Attributes of Copper CMP ........................................3
   Yasa Sampurno, Ara Philipossian, Sian Theng, Takenao Nemoto, Xun Gu, Yun Zhuang, Akinobu Teramoto, and Tadahiro Ohmi

Pad Topography, Contact Area and Hydrodynamic Lubrication in Chemical-Mechanical Polishing.................................................................9
   Leonard J. Borucki, Ting Sun, Yun Zhuang, David Slutz, and Ara Philipossian

MULTI-SCALE AND FUNDAMENTAL MODELING OF CMP

* Understanding Multi-Scale Pad Effects in Chemical Mechanical Planarization.................................................................17
   Abhijit Chandra, Ashraf. F. Bastawros, and Pavan K. Karra

A Study to Estimate the Number of Active Particles in CMP ........................................29
   Jeremiah Mpagazehe, Geo Thukali, and C. Fred Higgs III

Integrated Tribo-Chemical Modeling of Copper CMP....................................................35
   Fiona M. Doyle, Shantanu Tripathi, Seungchoun Choi, and David A. Dornfeld

CMP OF EMERGING MATERIALS

Chemical-Mechanical Polishing of Optical Glasses.........................................................43
   Elisabeth Becker, Andreas Prange, and Reinhart Conradt

*Invited Paper

v
* Opportunities and Challenges to Sustainable Manufacturing and CMP .......................................................... 49
  David A. Dornfeld

ADVANCES IN SLURRY PARTICLE MECHANISM OF METAL AND DIELECTRIC CMP

Accuracy Improvements in LPC Measurements for CMP slurries .......................................................... 59
  David Boldridge and Bruno Tolla

CHEMICAL AND PHYSICAL MECHANISM OF METAL AND DIELECTRIC CMP

* Influence of Chemical-Mechanical Polishing Process on Time Dependent Dielectric Breakdown Reliability of Cu/Low-k Integration .......................................................... 67
  Yohei Yamada and Nobuhiro Konishi

Fundamental Mechanisms of Copper CMP — Passivation Kinetics of Copper in CMP Slurry Constituents .......................................................... 79
  Fiona M. Doyle, Shantanu Tripathi, and David A. Dornfeld

An Investigation of the Influence of Orientation on CMP Through Nanoscratch Testing .......................................................... 85
  Sarah Neyer, Burak Ozdoganlar, and C. Fred Higgs III

Novel Ceria-Polymer Composites for Reduced Defects During Oxide CMP .......................................................... 91
  Cecil Coutinho, Subrahmanya Mudhivarthi, Vinay Gupta, and Ashok Kumar

POSTER SESSION

The Effects of Hardness Variation on Chemical Mechanical Polishing of Copper Thin Films .......................................................... 99
  Joseph Bonivel, Yusuf Williams, Sarah Blitz, and Ashok Kumar

*Invited Paper
Novel Method to Synthesize Ceria Coated Silica
Myoung-hwan Oh, Jae Seok Lee, Sushant Gupta, Tae Gon Kim, Aniroddh Kaanna, and Rajiv K. Singh

Study of Conditioner Abrasives in Chemical Mechanical Planarization
Chhavi Manocha, Ashok Kumar, and Vinay K. Gupta

CMP IN MEMORY AND DATA STORAGE TECHNOLOGIES

* Issues and Challenges of Chemical Mechanical Polishing for Nano-Scale Memory Manufacturing
Choonkun Ryu, Jonghan Shin, Hyungsoon Park, Nohjung Kwak, Kwon Hong, and Sungki Park

TOOL/PROCESS DEVELOPMENT SUCH AS eCMP AND LOW-SHEAR CMP

Optimization of Material Removal Efficiency in Low Pressure CMP
Dincer Bozkaya and Sinan Muftu

Role of Phosphoric Acid in Copper Electrochemical Mechanical Planarization Slurries
Serdar Aksu

ADVANCED CMP PROCESS CONTROL TECHNIQUES

* CMP for High Mobility Strained Si/Ge Channels
Kentarou Sawano, Yasuhiro Shiraki, and Kiyokazu Nakagawa

*Invited Paper
Novel End-Point Detection Method by Monitoring Shear Force Oscillation Frequency for Barrier Metal Polishing in Advanced LSI ................................................................. 157

Xun Gu, Takenao Nemoto, Yasa Adi Sampurno,
Jiang Cheng, Sian Nie Theng, Ara Philipossian,
Yun Zhuang, Akinobu Teramoto, Takashi Ito,
Shigetoshi Sugawa, and Tadahiro Ohmi

Author Index ........................................................................................................ 163

Subject Index ........................................................................................................ 165