TABLE OF CONTENTS

1  Comparison and Evolution of Copper CMP Consumable Technology
    David R. Evans

8  Development of “New Abrasive-Free Copper CMP Solutions” Based on
    Electrochemical and Film Analysis Method
    Jin Amanokura, Yasuo Kamigata, Masanobu Habiro, Hiroshi Suzuki and Masanobu Hanazono

20 Performance Comparisons of Abrasive Containing and Abrasive Free
    Slurries for Copper Low-k CMP
    John Nguyen, Gerald Martin

28 Modeling and Mapping of Nanotopography Interactions with CMP
    Brian Lee, Duane S. Boning, Winthrop Bayliss, Noel Poduje, and John Valley

40 Evaluation of the Chemical-mechanical Planarization (CMP) Performance
    of Silicon Nitride and Silicon Carbide as Hard Mask Materials for Cu-
    based Interconnect Technology
    Wei-Tso Tseng, Jia Lee, Satyijit Das, John Fitzsimmons, Glenn Biery, Edward Barth, Ronald
    Goldblatt

46 Pattern density effects in fixed abrasive polishing
    Rajasekhar Venigalla, Luertis Economikos, and S.V. Babu

52 Silver Damascene Process with Cap Layer
    Masahiro Ota, Manaba Tsujimura, Hiroaki Inoue, Hirokazu Ezawa, and Masahiro Miyata

60 Removal of TaN/Ta Barrier with Variable Selectivity to Copper and TEOS
    Jinru Bian, John Quanci, and Matthew VanHanehem

66 New Slurry Formulation for Copper-CMP Process in a Damascene
    Integration Scheme
    Valentina L. Terzieva, Bram M. Sijmus, Marc A. Meuris, Lothar Puppe and Gerd Passing

73 Engineering the Interaction Forces to Optimize CMP Performance
    G. B. Bason, I. Vakarelski, P. Singh, B. M. Moudgil

78 Mixed Abrasive CMP: A Study on Metal and Dielectric Films
    Anurag Jindal, Sharath Hegde, and S.V. Babu

84 Evaluation of Monodispersed Silica Particles and Ceria Coated Silica
    Particles for Chemical Mechanical Polishing
    Zhenyu Lu, Seung-Ho Lee, Egon Matijević and S. V. Babu
90  Mechanistic Understanding of Material Detachment During CMP Processing
Wei Che, Yongjin Guo, Ashraf Bastawros, Abhijit Chandra

96  Topography Reduction During Barrier CMP Improved Due to Tantalum Oxidation
Paul Lefevere, Katsuyoshi Ina, Kenji Sakai, Kazusei Tamai, Scott Rader

102 Simulation of Nanoscale Polishing of Copper with Molecular Dynamics
Y. Ye, R. Biswas, J. R. Morris, A. Bastawros, and A. Chandra

108 Optimization of Deposition Thickness and Over Polishing Time to Minimize Wafer Level Topography in Copper CMP
J.M. Kang, Shaoyu Wu, T. Selvaraj, Benfu Lin, P.D. Foo

114 Pad Conditioning and Pad Surface Characterization in Oxide Chemical Mechanical Polishing
A. Scott Lawing

120 Effect of CMP Pad Exposure to Aqueous Media on the Pad Properties. Part 1. Dynamic Mechanical and Modulated DSC Analysis
A. Tregub, M. Moinpour, and J. Sorooshian

127 Analysis of Local Planarization with Polishing Time, Film Thickness, Chemical Non-Uniformity, Line Density, Line Width, and Pad Relaxation Property
Jinru Bian and John Quanci

136 Study of Defect Generated During Cu/Black Diamond CMP Process
Shaoyu Wu, Ning Li, J. M. Kang, T. W. M. Lam, B. Lin, T. Selvaraj, S. P. Zhao, R. Kumar and P. Foo