

Revised CAMP Seminar

Effects of Pad Asperity and Properties with Slurry in Cu CMP

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ABSTRACT

Chemical Mechanical Planarization/Polishing (CMP) has been popularly adopted in semiconductor manufacturing to achieve global wafer planarization and chip to device level planarization with polishing effects. Function of pad is to provide a global base datum for CMP performance and local engagement of slurry and nano-particles of abrasive grits. Interaction of pad with slurry can be considered with an engaged zone of hydrodynamic flow of inbound and outbound slurry carried by planetary motion and also local pad asperity distribution to roll and contact with wafer or film surface with or without nano-particles. This study is to analyze the 3D pad topography to quantize the pad performance by bearing area ratio (BAR) before and after pad dressing, and then to establish pad topography model for CMP process. The break-in time index and pad dressing index have been developed and verified for Cu CMP. Related pad performance index will be discussed with slurry retention rate. Pad asperity and properties have been tested by experiments to investigate the hard and soft pad issues for Cu CMP process. Results of this study can be adapted for diamond conditioner design to achieve demands in advanced node of CMP.

Keywords: Pad asperity distribution, Slurry retention rate, Cu CMP, Pad performance, Pad dressing.

Friday, August 9, 2019

10:30 AM - 11:30 AM

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Refreshments will be served prior to Seminar

Bio attached



Brief of Chao-Chang A. Chen

- **Current Position**
 - Director, **CMP Innovation Center (CIC)**, NTUST since 2014
 - Distinguished Professor, NTUST since 2013
 - Visiting Professor of Kyushu Institute of Technology, Japan since 2011
- **Education**
 - Ph.D. in Mechanical Engineering, University of Wisconsin-Madison, WI, USA, 1994
 - MS in Industrial Engineering, Mfg. System, UW-Madison, USA, 1991
 - BS & MS in ME, National Chiao Tung University, Hsinchu, Taiwan, 1985 & 1987
- Work Experience**
 - ◆ 2001-2009 & 2009-2012: Associate and Professor, NTUST
 - ◆ 2015.08-2018.07 Chairman, Department of ME, NTUST
 - ◆ 2015.03-07: **Visiting Researcher, TSMC, Taiwan**
 - ◆ 2012-2013: Vice Dean, Office of R&D (ORD), NTUST
 - ◆ 2009-2010: Director, Industrial and Academic Center, ORD, NTUST
 - ◆ 2008-2009: Director, Technical Transfer Office, ORD, NTUST
 - ◆ 2012-2015, 2017-present: **President, CMP User Group, Taiwan**
 - ◆ 2017-present: **President, Taiwan Society of Abrasive Technology**
 - ◆ 2001-present: Technical Committee, CNS, Taiwan
 - ◆ 2000-present: Board Member, SME Taipei Chapter
- **Honors/Awards**
 - ◆ **President Award, SME, 2015**
 - ◆ **Outstanding R&D Award, NTUST, 2013-2017**
 - ◆ **Merit Award, SEMI Taiwan, 2013**
 - ◆ **Excellent R&D Award, NTUST, 2008-2012**



Biography:



Professor Chao-Chang Arthur Chen received B.S. and M.S. degree of Mechanical Engineering (ME) from National Chiao Tung University, Taiwan in 1985 and 1987 and also M.S. Industrial Engineering (IE) in Manufacturing System and Ph.D. ME from the University of Wisconsin, Madison, USA in 1991 and 1994, respectively. In 1994, he worked as Associate Professor at the Department of Mechanical Engineering, Tamkang University, Taiwan and joined the Department of ME, National Taiwan University of Science and Technology (NTUST) in 2001. Then he has been promoted as Professor in 2008 and University Distinguished Professor in 2013. He has been served as the Deputy Dean of Office of Research and Development during 2013-2014. In 2014, he established the CMP Innovation Center (CIC) in NTUST and appointed as Director of CIC until now. In 2015, he also appointed as a Visiting Researcher in the Manufacturing Technology Center at the Taiwan Semiconductor Manufacturing Company (TSMC), Taiwan for collaboration of advanced CMP process development. Professor Chen's research interests are in the areas of wafer processing and CMP, precision molding of optical elements with micro structures, manufacturing analysis, and developing innovative CMP polishing pad and slurry composites. Professor Chen has received over 20 patents, including 3 USA patents and over US\$ 2M research grants at NTUST in the past five years. He is the author of more than 110 professional papers and served as a guest editor of the Vol. 140, *Journal of Materials Processing Technology* (September 2003) and Academic Program Chair of the International Conference of Planarization/Polishing Technology (ICPT) 2008 and Conference Chair of ICPT 2013 held in Hsinchu. At present, Professor Chen serves as the Presidents of the CMP User Group, Taiwan (CMPUG_Tawian) and the Taiwan Society of Abrasive Technology (TSAT). He also is the elected senior board member of the Taipei Chapter of the Society of Manufacturing Engineer (SME) and the SEMI Taiwan IC Committee Member. He has been the recipient of SEMI Taiwan Merit Award in 2013, SME President Award in 2015, and SEMI Taiwan Standard Contribution Award in 2016. He may be reached at 886-939-982213 or by email artchen@mail.ntust.edu.tw.