## Evaluation of Fixed Abrasive Technology for 90nm Node Cu/low-k CMP process

Shao-Chung Hu, Teng-Chun Tsai, Fu Yang, Chih-Feng Dai, Chien-Chung Huang, Gene Li and Tri-Rung Yew United Microelectronics Corp., CRD

No. 3, Li-Hsin Rd. 2, Science-Based Industrial Park, Hsinchu, Taiwan, R.O.C.

Tel:+886-3-5789158 ext:33080 Fax:886-3-5646294 E-Mail: james\_sc\_hu@umc.com

## **ABSTRACTS**

In this paper, an FA technology for Cu-CMP on advanced BEOL Cu/low-k interconnections was evaluated. Comparisons between conventional slurry-base CMP process and FA CMP process were presented in terms of metal thinning, electrical data and defectivity.

Two approaches were investigated for Cu-CMP. One is the conventional CMP with silica slurry (denoted as slurry-CMP) and ploy-urethane pad. The other one is FA-CMP with fixed-abrasive pad and non-abrasive chemical. All the CMP process was carried on the rotary polisher. Pattern wafers constructed with low-k dielectric/hard mask/PVD liner-seed/electro-plating copper film were utilized in all the experiments.

Figure 1 and Figure 2 show that the behavior of metal thinning between slurry-CMP and FA-CMP. It can be found that FA-CMP has much lower metal thinning than slurry-CMP. By comparison, FA-CMP shows that the metal thinning is not sensitive to line width and pattern density. This characteristic is also reflected on the electrical performance obviously, as shown in Figure 3. It can be found that FA-CMP has lower wiring resistance and tighter distribution than slurry-CMP.

In summary, this study demonstrated that FA-CMP has excellent performance on metal thinning and resistance distribution for Cu-CMP. This indicates that FA-CMP has great potentiality and good extensibility for satisfying the requirements of Cu-CMP on planarity at 90nm node.



Figure 1. Effect of line width on metal thinning, showing low metal thinning and insensitive effect of line width on FA-CMP.



Figure 2. Effect of pattern density on metal thinning, showing FA-CMP has lower metal thinning and insensitive effect on pattern density.



Figure 3. Wiring resistance on different pattern density, showing FA-CMP has lower resistance and tighter distribution.