TECHNICAL SESSIONS

June 14, 2013

09:00-10:20

Session 5: Unit Process I
Session Co-chairs:
Naoya Inoue, Renesas Electronics
Ivo Raaijmakers, ASM International nv

09:00-09:30

5-1 ***INVITED - Damage Free Cryogenic Etching of Ultra Low-k Materials***

Mikhail R. Baklanov{1}, Liping Zhang{1}, Rémi Dussart{2}, Jean-François de Marneffe{1}
{1}IMEC, Belgium, {2}GREMI/Université d'Orléans, France

<*Abstract*>
Cryogenic etching was applied to porous organosilicate (OSG) films. Plasma-induced damage was reduced due to the protective effect of etch by-products condensed in pores of low-k materials. Almost no carbon depletion was observed when the wafer temperature is below a certain critical level. Most of experiments were carried out with SF6 plasma. The addition of SiF4/O2 into the gas discharge allows a further reduction of plasma-induced damage by formation of a SiOxFy passivation layer.

09:30-09:55

5-2 ***Extremely Non-Porous Ultra-Low-K SiOCH (k=2.3) with Sufficient Modulus (>10 GPa), High Cu Diffusion Barrier and High Tolerance for Integration Process Formed by Large-Radius Neutral-Beam Enhanced CVD***

Yoshiyuki Kikuchi{2}, Akira Wada{1}, Seiji Samukawa{1}
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<*Abstract*>
We developed a practical large-radius neutral beam enhanced CVD with a dimethoxy tetramethy ldisiloxane (DMOTMDS) to form low-k SiOCH film on 8-inch Si wafers. We fabricated extremely non-porous film with an ultra-low k-value of 2.3 and a sufficient modulus (>10 GPa). This particular film did not show any damage from the oxygen plasma and acid or alkali solutions used in the fabrication process. Furthermore, the dense film almost completely resisted Cu diffusion into the film during thermal annealing.

09:55-10:20

5-3 ***Macroscopic and microscopic interface adhesion strength of copper damascene interconnects***

Nobuyuki Shishido{4}, Shoji Kamiya{4}, Chuantong Chen{4}, Hisashi Sato{4}, Kozo Koiwa{4}, Masaki Omiya{3}, Masahiro Nishida{4}, Takashi Suzuki{1}, Tomoji Nakamura{1}, Takeshi Nokuo{2}, Toshiaki Suzuki{2}
{1}Fujitsu Laboratories Ltd., Japan; {2}JEOL Ltd., Japan; {3}Keio University, Japan; {4}Nagoya Institute of Technology, Japan

<*Abstract*>
Macroscopic and microscopic adhesion strength of damascene interconnects was investigated by evaluating local strength through delaminating different scales of adhesion area under SEM observation. Macroscopic strength obtained by the areas larger than the copper grain was almost constant after considering the macroscopic plastic deformation. However, microscopic strength obtained by the areas smaller than the copper grain spread around the macroscopic strength and was highly sensitive to the copper grain structure, especially the grain boundary.

10:20-10:40 **Break**