2013 IEEE International Interconnect Technology Conference
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TECHNICAL SESSIONS

June 14, 2013

10:40-12:00

Session 6: Unit Process II
Session Co-chairs:
Ivo Raaijmakers, ASM International nv
Naoya Inoue, Renesas Electronics

10:40-11:10

6-1 ***INVITED - Grain boundary and surface scattering in interconnect metals***

Kevin Coffey{2}, Katayun Barmak{1}, Tik Sun{2}, Andrew Warren{2}, Bo Yao{2}
{1}Columbia University, United States; {2}University of Central Florida, United States

<Abstract>
The talk addresses the classical size effect in interconnect metals and presents our work on understanding and quantifying the contributions of grain boundary and surface scattering to the observed resistivity increase. Experimental studies of both Cu and W films will be described, including the development of improved metrology techniques for nanoscale metals characterization. The extent to which the experimental data supports the theoretically expected interactions between surface and grain boundary scattering mechanisms will also be discussed.

11:10-11:35

6-2 ***Deposition Behavior and Substrate Dependency of ALD MnOx Diffusion Barrier Layer***

Kenji Matsumoto{3}, Kaoru Maekawa{1}, Hiroyuki Nagai{3}, Junich Koike{2}
{1}TEL Technology Center, America, LLC., United States; {2}Tohoku University, Japan; {3}Tokyo Electron Ltd., Japan

<Abstract>
We investigated the possibility of applying an ALD method to form a Cu diffusion barrier layer of MnOx in an attempt to develop a deposition process which would not be influenced by absorbed water in a substrate. The MnOx formed by ALD using (EtCp)2Mn and H2O had the following features. (1) Capability of thickness control of the MnOx layer by changing the ALD cycle number. (2) Capability of the ALD-MnOx formation on low-k dielectrics by surface modification. (3) Good adhesion of the Cu/ALD-MnOx/SiOCH structure showing a fracture toughness of 0.3 MPam1/2. (4) Good diffusion barrier property for the thickness of over 1 nm. (5) Minimizing via resistance increase accompanied by the formation of MnOx on Cu.

11:35-12:00

6-3 ***Pore-Sealing Process Initiated by Self-Assembled Layer for Extreme Low-K SiOCH (k=2.0)***

Akiko Kobayashi, Dai Ishikawa, Kiyohiro Matsushita, Nobuyoshi Kobayashi
ASM, Japan

<Abstract>
A pore sealing process by Plasma-enhanced ALD has been developed, which enabled simultaneous restoration and pore-sealing film formation on damaged low-k film with k = 2.0. The precursor adsorbed preferentially at OH termination on the low-k surface to form self-assembled SiOC layer, which simultaneously recovered low-k damage. It is suggested that the SiOC layer narrowed the pore opening at the low-k surface, and was followed by hermetic SiCN layer formation by PEALD. The current process will pave the way for enabling extremely thin diffusion barrier <2nm at 1X nm node Cu interconnect.

12:00-13:30 Lunch