Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Electrical properties of vanadium dioxide – dielectric – metal structures and the metal-insulator transition[1] KOEN MARTENS, KULeuven ESAT department / IMEC, IULIANA RADU, KULeuven Physics department / IMEC, SOFIE MERTENS, XIAOPING SHI, MARC SCHAEKERS, IMEC, STEFAN DE GENDT, KULeuven Chemistry department/ IMEC, MARC HEYNS, KULeuven Materials Science department / IMEC, JORGE KITTL, IMEC — VO_2 and its metal-to-insulator transition (MIT) are of interest for memory and logic nanoelectronic devices due to its very fast transition, its full volume transition implying good scalability and reliability and relatively large resistance on/off ratio of 2-5 orders of magnitude. In this work the equivalent of the heart of MOS (metal-oxide-semiconductor) technology, the MOS capacitor is investigated for the VO_2 case in which the Si is replaced by VO_2. Thermally oxidized VO_2 with a HfO_2 or Al_2O_3 dielectric grown on top with Atomic Layer Deposition were used to form MOS structures. The MOS capacitor electrical properties are analyzed such as the gate current and capacitance behavior with special regard to the MIT. The influence of the MIT on gate dielectric tunneling is shown and modeled as well as RRAM phenomena and an evaluation of the field effect. Implications for the field-induced metal-insulator transition and for device applications are discussed.

[1]The FWO is acknowledged for funding.

Koen Martens
KULeuven ESAT department

Date submitted: 13 Nov 2011 Electronic form version 1.4