Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Alloyed Hf-La High-k Oxide Film Grown by Remote Plasma Atomic Layer Deposition[1] FU TANG, CHIYU ZHU, ROBERT NEMANICH, Arizona State University — The growth of alloyed Hf-La oxide was investigated using remote plasma atomic layer deposition (RPALD) at low temperatures ranging from 80 to 250C. The low temperature process is particularly important for the applications in thin film transistors, where the device is very often fabricated on flexible plastic substrate. Alloyed oxide films were deposited with 1-3 cycles of La oxide between two adjacent Hf oxide cycles. The atomic bonding structure was determined by in situ XPS. AFM and TEM were used to characterize the morphology and crystalline structure. The XPS results indicated that the percentages of Hf and La components in the alloyed films can be controlled by the ratio of the number of Hf and La cycles. In addition, carbon residue in the alloyed film is reduced compared with that of a pure La oxide film. This is attributed to the role of Hf in preventing formation of La carbonate. The AFM and TEM images indicated that the periodic alloying has suppressed the crystallization of HfO2 and led to improvement of the morphology compared with the roughness of the pure Hf oxide film. The IV curves show that the alloyed Hf-La oxide film has a break down voltage of 3 MV/cm.

[1]Supported through US Army Cooperative Agreement W911NF-04-2-0005 (FDC-10-4.6)

Robert Nemanich
Arizona State University

Date submitted: 19 Nov 2010 Electronic form version 1.4