

Abstract Submitted  
for the MAR06 Meeting of  
The American Physical Society

**Terahertz Spectroscopy as a non contact estimation technique of defect states in high dielectric constant materials** AMARTYA SENGUPTA, APARAJITA BANDYOPADHYAY, New Jersey Institute of Technology, HAKAN ALTAN, City College of New York, JOHN FEDERICI, HAIM GREBEL, New Jersey Institute of Technology — A large number of gate dielectric materials have been examined during the past few years to replace Silicon dioxide in the MOSFET industry to reduce gate leakage currents for microfabrication of devices. Among them, Hafnium based materials have become a very promising candidate. In the reported work, the effect of Hafnium dioxide films on p-type silicon substrates has been investigated and compared with conventional dielectric material, Silicon dioxide, using CW visible pump/THz probe spectroscopy. Drude analysis of the experimentally obtained differential transmission spectra evaluates the electric permittivity of the interfacial layer and the calculated defect density is found to be higher for  $\text{HfO}_2$  than for  $\text{SiO}_2$  which agrees with Hall measurements. Additional measurements on Silicon Nitride deposition and photoresist coated p+ Silicon on p-type silicon wafers without any oxide gave an interfacial defect density 50 times higher than that of  $\text{SiO}_2/\text{p+}$  interface. Results indicate that the mobility of the layer underneath Hafnium is less than that of Silicon. Hence the present study emphasizes the advantage of THz spectroscopy as a non-contact tool for semiconductor metrological applications.

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Date submitted: 28 Nov 2005

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