Abstract Submitted
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Galvanomagnetic Channel Mobility Measurements of low-k and high-k Transistors.[1] R. AGRAWAL, R. MAHAJAN, R.T. BATE, W.P. KIRK, University of Texas - Arlington, G. PANT, B.E. GNADE, R.M. WALLACE, University of Texas - Dallas — This paper reports a different diagnostic technique for SiO_2 and HfSiO gate stacks which can determine true mobility (μ) regardless of trap characteristics. It can be used in the wafer fab to give workers greater insight into determining the true drift mobility. Effective mobility (μ_{eff}) measurements in high-k transistors are ambiguous as a diagnostic technique because there are two different mechanisms by which μ_{eff} can be degraded: (1) Enhanced scattering of carriers by phonons and by charged defects at or near the interface, and (2) Reduction of the channel carrier density by trapping. Conventional measurements cannot distinguish between the two mechanisms of mobility degradation, hence their contributions cannot be determined. The trapping can cause μ_{eff} to underestimate μ. The potential use of new materials for the conducting channel compounds the uncertainty about what the true μ should be. So, it is highly desirable to measure both μ and μ_{eff} to understand what is limiting the channel current. Our method employs galvanomagnetic (Hall effect *and* magnetoresistance) measurements on SiO_2 and HfSiO transistors to determine the drift velocity of carriers in the channel, even in the presence of carrier trapping. We will report on Hall and magnetoresistance measurements using specially designed and fabricated low-k and high-k transistors.

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