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Charge trapping/de-trapping in nitrided SiO2 dielectrics and its influence on device reliability KENNETH KAMBOUR, SAIC, HAROLD HJALMARSON, Sandia National Laboratories, DUC NGUYEN, CAMRON KOUHESTANI, RODERICK DEVINE, AFRL/RVSE — Field effect devices with insulator gate dielectrics are excellent test vehicles to probe the physics of defects and charge trapping in the insulator/ semiconductor structure. p-channel field effect device reliability under negative bias stressing has been identified to originate from at least two terms: a) charged defect generation at the Si substrate/SiOxNy interface and b) charge trapping at neutral defect pre-cursors in the "bulk" of the SiOxNy beyond the interface. Measurements of transistor characteristics enable extraction of the two terms. We report the results of such measurements and demonstrate that short time effects are associated primarily with electric field assisted tunneling of holes from the inversion layer to neutral traps. This is confirmed by bias stressing measurements at different frequencies in the range 1 Hz to 2 MHz. First principles modeling of the tunneling/trapping phenomena is presented. K.Kambour worked under contract FA9453-08-C-0245 with the Air Force Research Laboratory/RVSE. Sandia National Labs is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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