Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

**Transport properties of $SrTiO_3$ / wide-gap insulator heterointerfaces** KESIUKE SHIBUYA, TSUYOSHI OHNISHI, TAKAYUKI UOZUMI, TAISUKE SATO, MIKK LIPPMAA, University of Tokyo, HIDEOMI KOINUMA, National Institute for Materials Science — A field-effect transistor is a sensitive probe for the investigation of interfacial electronic properties. We have demonstrated the importance of an epitaxial interface, using $SrTiO_3$ (100) single crystal field-effect transistors with amorphous and epitaxial $CaHfO_3$ layers as gate insulators. The devices with amorphous insulator layers showed n-type transistor operation with a field-effect mobility of 0.4 to 0.5 $cm^2$ / V s at room temperature. A large threshold voltage shift was observed at low temperatures and the transistor performance was temperature independent when that shift was taken into account. The device properties were greatly affected by the interface between amorphous insulator and $SrTiO_3$. To improve the quality of the channel layer-insulator interface, an ultrathin epitaxial $CaHfO_3$ layer was grown on the $SrTiO_3$ substrate surface at high temperature, followed by room-temperature deposition of an amorphous insulator layer. The devices with epitaxial interfaces exhibited a large improvement over the amorphous transistors. A field-effect mobility of around 2 $cm^2$ / V s was attained at room temperature and found to increase at low temperature, reaching 25 $cm^2$ / V s at 50 K. This result means that the carriers induced by the field effect behaved as would be expected for electron-doped $SrTiO_3$.

Kesiuke Shibuya
University of Tokyo

Date submitted: 30 Nov 2005 Electronic form version 1.4