Electric field control of spin precession in KTaO$_3$ field-effect transistor

HIROYUKI NAKAMURA, Osaka University, TSUYOSHI KIMURA, Osaka Univ — Field-effect transistors (FET) with KTaO$_3$ single crystal channel were fabricated to study spin-orbit coupling effects on the gate-induced electron gas. By applying gate voltage via organic gate insulator parylene, an electron accumulation layer was successfully formed at the interface of KTaO$_3$. By analyzing magnetoresistance associated with weak ntilocalization at low temperature, we find that the spin precession length is remarkably short in this system, in the 20-70 nm range [1]. The factors possibly leading to this remarkably short spin precession length are 1) heavy electron mass originating from $d$-bands, 2) strongly asymmetric potential well, and 3) strong spin-orbit coupling caused by 5$d$ element, tantalum.


Hiroyuki Nakamura
Osaka University