Raman spectroscopic studies of Ti$_{1-x}$Ta$_x$O$_2$ alloy thin films$^1$ S. SAHA, A. ROYBARMAN, NUSNNI-NanoCore, National University of Singapore, C.B. TAY, Department of Electrical and Computer Engineering, National University of Singapore, T. SARKAR, Y. ZHAO, NUSNNI-NanoCore, National University of Singapore, S. TRIPATHY, IMRE, A*STAR, Singapore, S. DHAR, - ARIANDO, NUSNNI-NanoCore, National University of Singapore, S.J. CHUA, Department of Electrical and Computer Engineering, National University of Singapore, T. VENKATESAN, NUSNNI-NanoCore, National University of Singapore — Anatase Ti$_{1-x}$Ta$_x$O$_2$ thin films have been of interest not only because of the recently found defect originated room temperature ferromagnetism, but also because of the wide possibilities of its application as transparent conducting oxide in flat panel displays, light emitting diodes and solar cells. The incorporation of a foreign element in a host oxide crystal has conventionally been referred to as doping. However, recently we have experimentally shown that even with as less as 1% Ta incorporation in TiO$_2$, a totally new alloy system is formed. Here we present a Raman and x-ray diffraction study of anatase Ti$_{1-x}$Ta$_x$O$_2$ thin films grown on (100) LaAlO$_3$ substrate by PLD to understand the crystal structure and defects in the Ta-incorporated TiO$_2$ thin films. We find that as Ta is incorporated in the TiO$_2$ lattice the out-of-plane phonons undergo red-shift while the in-plane phonon undergoes a blue-shift, suggesting an expansion of the TiO$_2$ lattice along the out-of-plane direction with a concomitant in-plane contraction.

$^1$We acknowledge NRF-CRP (Grant No. NRF2008NRFCRP002-024), NUS YIA, NUS cross-faculty grant, FRC, BMBF and NUSNNI.