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Raman spectroscopic studies of $Ti_{1-x}Ta_xO_2$ alloy thin films[1] S. SAHA, A. ROYBARMAN, NUSNNI-NanoCore, National University of Singapore, C.B. TAY, Department of Electrical and Computer Engineering, National Univesity 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 Univesity of Singapore, T. VENKATESAN, NUSNNI-NanoCore, National University of Singapore — Anatase $Ti_{1-x}Ta_xO_2$ 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 $Ti_{1-x}Ta_xO_2$ 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.

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Ariando Ariando
NUSNNI-NanoCore, National University of Singapore

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