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Study of the Ta substitutionality in pulsed laser deposited Ta doped TiO_2 films by Rutherford backscattering-ion channeling spectroscopy M. MOTAPOTHULA, A. ROY BARMAN, S. DHAR, A. ARIANDO, A. ANNADI, T.K. CHAN, G. XIONG, M. BREESE, G. OSIPOWICZ, S.J. CHUA, T. VENKATESAN, NanoCore NUS Singapore, NANOCORE NUS SINGAPORE TEAM — In the present work we report on the growth of high quality epitaxial TiO_2 thin films after 0-7.5% Ta doping at 500-800°C in an oxygen partial pressure of 10^{-1} -10^{-6} torr on (001) $LaAlO_3$ substrate by pulsed laser deposition (PLD) technique. Rutherford backscattering-Ion channeling analysis directly reveals quantitatively amount of Ta substitution in Ti sites along with the degree of disorder at the Ti site indicated by the channeling minimum yield, χ_{min}. Under optimum condition χ_{min} is of the order of 2% implying that greater than 98% of the Ta substitute in the Ti site. On the one hand χ_{min} increases with increasing O_2 partial pressure and decreasing deposition temperature. On the other hand, it decreases with increasing Ta concentration. These variations of the channeling yields are directly correlated with the conductivities of these films which suggest that Ta is substituting in a 5+ state at the Ti4+ sites.

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