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Universal Kondo effect in $Ti_{0.94}M_{0.06}O_2$ (M = Nb, Ta) Thin Films KALON GOPINADHAN, NUSNNI-NanoCore, National University of Singapore, Singapore 117576, A. ROY BARMAN, A. ANNADI, T.P. SARKAR, Department of Physics, National University of Singapore, Singapore 117542, W.M. LU, NUSNNI-NanoCore, National University of Singapore, Singapore 117576, Z.Q. LIU, AMAR SRIVASTAVA, - ARIANDO, Department of Physics, National University of Singapore, Singapore 117542, SANKAR DHAR, T. VENKATESAN, NUSNNI-NanoCore, National University of Singapore, Singapore 117576 — We show that $Ti_{0.94}M_{0.06}O_2$ (M = Nb, Ta) thin films are Kondo systems by angle dependent magneto-resistance measurement. Surprisingly, the data fitted by both Goldhaber-Gordon and Hamann formula yield comparable carrier dependent Kondo temperatures (10 - 60 K). The Kondo temperature dependence on carrier density was different for Ta and Nb incorporated in TiO_2 but this result could be understood on the basis of the formation of compensating defects (Ti vacancies) which also act as localized magnetic scattering centers. Using the unitarity-limit resistivity and Kondo temperature estimated from these fits the normalized resistivity versus temperature for all these films collapse into a universal curve consistent with data observed in metallic systems. However, the size of the Kondo scattering is at least an order of magnitude larger than in metallic systems. Further, from the extrapolation of the Kondo temperature we are able to predict that Ta is a better candidate for observation of ferromagnetism versus Nb.

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