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Mixed-valence magnetism in TiO_2/TiO_x superlattices W.C. HSIEH, National Sun-Yat Sen University, Taiwan, P.V. WADEKAR, University of Liverpool, UK, H.C. HUANG, C.F. CHANG, National Sun-Yat Sen University, Taiwan, M.S. WONG, National Dong Hua University, Taiwan, H.W. SEO, University of Arkansas, USA, F.C. CHUANG, Q.Y. CHEN, National Sun-Yat Sen University, Taiwan — Epitaxial TiO_2 and TiO_x superlattices, $\sim$ 1-nm thick per layer by sputtering at 570°C using pure argon on sapphire substrates. From HR-TEM, the periodically alternating layers are well-defined. XPS analyses based on the binding energy of Ti $2p_{3/2}$ peaks suggest the co-existence of Ti^{+3} and Ti^{+4}, thus verifying the mixed-valence nature. The M(H) curves measured at room temperature using SQUID showed hysteretic loops typical of ferromagnetism. Electrical transport measurements were done at zero field demonstrate transition of charge ordering at low temperatures, reminiscent of what was found in Ti-rich $Ti_{1+x}O_2$ single-layer thin films, made by Ti ion implantation into TiO_2 crystals, in which randomly distributed TiO_2, Ti_2O_3 and TiO were found to coexist. Preliminary First-principle (*ab initio*) calculations to understand the roles of oxygen vacancies in various TiO_2 super-cells could indeed lead to spontaneous magnetizations. We thus argue that mixed-valence titanium ions are responsible for the magnetism

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