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Correlation driven metal insulator transition as a function of thickness in SrRuO3 thin films[1] GERTJAN KOSTER, JEROEN BLOK, WOLTER SIEMONS, ZHICHENG ZHONG, PAUL KELLY, GUUS RIJNDERS, DAVE BLANK, MESA+ institute for nanotechnology, University of Twente, The Netherlands — Recently there has been debate on the existence of a fundamental thickness limit of a metallic ground state of SrRuO3 thin films and what mechanism drives the system to an insulating state at low thicknesses should there be a transition. We present further evidence that a fundamental thickness level does indeed exist and that the metal-to-insulator transition is in fact a transition from a conducting ferromagnetic state to an insulating anti-ferromagnetic state that occurs from 3 to 4 unit cell layers of SrRuO3. We show this in two steps, in the first step we do Density Functional calculations on SrRuO3 that show a ferromagnetic – anti-ferromagnetic phase transition occurring in SrRuO3 at large values of the electron correlation correlation U. In the second step we use ruthenium 3d x-ray photoemission spectra obtained in situ to demonstrate that U increases for very thin films of SrRuO3, driving the metal-to-insulator transition.

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