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Strong anisotropy and electronic confinement in 1D quantum-stripe superlattices of iridium oxides[1] S. S. A. SEO, J. H. GRUENEWALD, J. W. BRILL, G. CAO, Department of Physics and Astronomy, University of Kentucky, J. HWANG, Department of Materials Science and Engineering, The Ohio State University, J. KIM, Advanced Photon Source, Argonne National Laboratory, H. S. KIM, H. Y. KEE, Department of Physics, University of Toronto — One-dimensional (1D) systems offer a platform for studying low-dimensional phenomena associated with the onset of critical quantum phase transitions. Here we present a new approach of synthesizing 1D quantum systems by creating dimensionally-confined stripe-superlattices from *in-plane* oriented 2D layered crystals. We have synthesized 1D IrO_2 stripes using *a*-axis oriented superlattices of Sr_2IrO_4 and the wide bandgap insulator $LaSrGaO_4$, both of which contain the K_2NiF_4 symmetry. The dimensional confinement of our 1D superlattices is confirmed experimentally. Linearly polarized optical spectroscopy shows anisotropic characteristics and one-dimensional electronic confinement of the $J_{eff} = 1/2$ band. Spin and orbital excitations observed in resonant inelastic x-ray scattering suggest enhanced exchange interactions and deconfined orbital excitations in the 1D IrO_2 stripes. The observed electronic confinement is consistent with density functional theory calculations. The method of transforming layered materials into 1D striped structures is a viable technique for studying dimensional-crossover phase transitions from two- to one-dimension.

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