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Observation of ferroelectricity at room temperature in ∼1 nm thick conducting $BaTiO_{3-\delta}$ SEUNGRAN LEE, KRISS, Daejeon 305-350, Rep. of Korea, L. BAASANFORJ, Uni. of Sci. and Tech., Daejeon 305-350, Rep. of Korea, JUNGWON CHANG, Dept. of Display and Semiconductor Physics, Korea University, Sejong 339-700, Rep. of Korea, INWOONG HWANG, Dept. of Physics, Chungnam Nat'l Uni., Daejeon 305-764, Rep. of Korea, JUNGRAE KIM, CCES-IBS, Seoul 151-742, Rep. of Korea, SEUNGBO SHIM, KRISS, Daejeon 305-350, Rep. of Korea, JONGHYUN SONG, Dept. of Physics, Chungnam Nat'l Uni., Daejeon 305-764, Rep. of Korea, JINHEE KIM, KRISS, Daejeon 305-350, Rep. of Korea — Efforts to search for new and multi-functionalities in thin-film systems have led important findings of unknown phenomena and functionality which do not appear in bulk systems. As film growth technique is advanced, one can decrease the film thickness even thinner down to ∼ nm, its unique physical properties are still appearing. For example, the superconducting metallic state of an $LaAlO_3/SrTiO_3$ (LAO/STO) heterostructure was found where LAO is about 3-4 unit cells (uc). An $SrRuO_3$ film exhibited its ferromagnetic metallicity down to 4-6 uc; a few years later, its ferromagnetism was found to be disappeared at 2-3 uc. Meanwhile, theoretical methods have predicted existence of ferroelectrical properties mostly in prototype ferroelectric $BaTiO_3$ (BTO): 3-6 uc. However, experimental verification to find such predicted thickness was hindered by large leakage current. Here we observed that ∼1 nm-thick conducting BTO fillms show ferroelectric switching at room temperature (RT), and BTO films are fully-strained on LAO/STO heterostructures thicker than 5 nm thickness. Our experimental results will enlarge applicable functional oxide devices for future applications.

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