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Current perpendicular-to-plane (CPP) metal-to-insulator transition in BaTiO3/LaAlO3/SrTiO3(100) hetero-interface[1] JONGHYUN SONG, SEUNGRAN LEE, JINHEE KIM, Dept. of Physics, Chungnam Natl Univ — The transport properties of ultra-thin BaTiO3 (BTO) films have been studied by employing a quasi 2-dimensional electron gas system (q2-DEG) of LaAlO3/SrTiO3 (LAO/STO) interface as the bottom electrodes. The LAO/STO layer is found to serve as the conducting electrode down to 2 K due to formation of conducting paths inside the LAO layer on to the metallic LAO/STO interface. Despite of the ultra-thin thickness of BTO films, current perpendicular-to-plane (CPP) show clear metal-to-insulator transitions with decreasing temperatures while the transition temperatures vary in the ranges of 150-310 K. The metallic behavior of the ultra-thin BTO can be understood with dominant electron-electron scattering, while the insulating state can be explained with variable-range-hopping conduction probably due to the dominant role of localized defect states in the BTO layers. The electrical properties are further investigated by increasing applied bias voltages. Our studies with combined ultra-thin ferroelectric and q2-DEG provide important clues to applicable devices with 2-dimensional carriers and/or ultra-thin ferroelectric layers with plausible explanations for their conduction mechanism.

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