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Polarization and resistive switching behavior of ferroelectric tunnel junctions with transition metal dichalcogenides TAO LI, ALEXEY LIPATOV, University of Nebraska-Lincoln, PANKAJ SHARMA, University of New South Wales, HYUNGWOO LEE, CHANG-BEOM EOM, University of Wisconsin-Madison, ALEXANDER SINITSKII, ALEXEI GRUVERMAN, University of Nebraska-Lincoln, ALEXEI GRUVERMAN TEAM, ALEXANDER SINITSKII TEAM, CHANG-BEOM EOM TEAM — Transition metal dichalcogenides (TMDs) are emerging 2-dimensional (2D) materials of the MX_2 type, where M is a transition metal atom (Mo, W, Ti, Sn, Zr, etc.) and X is a chalcogen atom (S, Se, or Te.). Comparing to graphene, TMDs have a sizable band gap and can be metal, half-metal, semiconductor or superconductor. Their band structures can be tuned by external bias voltage, mechanical force, or light illumination. Their rich physical properties make TMDs potential candidates for a variety of applications in nanoelectronics and optoelectronics. Ferroelectric tunnel junctions (FTJs) are actively studied as a next-generation of non-volatile memory elements. An FTJ comprises a ferroelectric tunnel barrier sandwiched between two electrodes. In this work, we investigate the resistive switching behavior of $MoS_2/BaTiO_3$-based FTJs. The ON/OFF ratio can be modulated via electric or mechanical control of the switched polarization fraction opening a possibility of tunable electroresistance effect. Effect of optical illumination on the polarization reversal dynamics has been observed and analyzed based on the polarization-induced modulation of the MoS_2 layered electronic properties.

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