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Electron Transport in Edge Metal-Insulator-Metal Tunnel Junctions Modulated by Underlying Ferroelectric Polarization Switching[1] KIBOG PARK, YOUNGEUN JEON, SUNGCHUL JUNG, HAN BYUL JIN, Ulsan National Institute of Science and Technology, Ulsan 689-798, South Korea, JAEHYEON GO, Hallym University, Chuncheon Gangwondo 200-702, South Korea, SOON-YONG KWON, Ulsan National Institute of Science and Technology, Ulsan 689-798, South Korea, NAM KIM, Korea Research Institute of Standards and Science, Daejeon 305-340, South Korea — The electron energy band profile in an Edge Metal-Insulator-Metal tunnel junction (EMIM) on a Insulator/Ferroelectric thin film was calculated by performing finite-element electrostatic modeling. It is found that the energy band profile in the EMIM junction alters significantly near the underlying Insulator/Ferroelectric layer depending on the polarization direction of ferroelectric layer. The energy band profile shows pinch-off when the interface bound charge at Insulator/Ferroelectric interface is negative while it shows a valley-like shape when the interface bound charge is positive. The change of the energy band profile depending on ferroelectric polarization was confirmed to result in a significant change of electron tunneling current by using WKB method. It is believed that this switching of electron tunneling resistance in the EMIM junction opens up a way to develop non-volatile ferroelectric memory devices using non-destructive read-out.

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Kibog Park
Ulsan National Institute of Science and Technology

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