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Rectification effects in InAs/AlGaSb three-terminal ballistic junctions MASATOSHI KOYAMA, Nanomaterials Microdevices Research Center, Osaka Institute of Technology, TATSUYA INOUE, NAOKI AMANO, TOSHIHIKO MAEMOTO, SHIGEHIKO SASA, MASATAKA INOUE, NANOMATERIALS MICRODEVICES RESEARCH CENTER, OSAKA INSTITUTE OF TECHNOLOGY TEAM — We report on the fabrication and the DC characterization of InAs/AlGaSb three-terminal ballistic junctions consisting of three quantum-wire T-shaped structures. InAs/AlGaSb quantum wells were grown by molecular beam epitaxy, and the three-terminal ballistic junctions were defined using electron beam lithography. Typical electron mobility of 80,000 – 200,000 cm^2/Vs and sheet carrier density of 1.0 – 2.0 x 10^{12} cm^{-2} were observed at 77K. Ballistic electron transport properties are due to the one-dimensional (1D) nature of electrons in InAs and dramatic changes in scattering probability from the 2D electron system, which are expected to occur at higher temperatures. We measured the rectified output voltage, V_C at the central branch of the devices at various temperatures. Nonlinearity and negative voltages at the central branch, regardless the polarities of the source-drain (left and right branch) voltage, were observed at each temperature. Clear rectification effects were observed in the ballistic junctions even at room temperature. Details of the triode characteristics in the InAs/AlGaSb ballistic devices will be discussed at the conference.

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