

## Preparation and Rectification Function of Multilayer Oxide p-i-n Junctions (LT26)

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The whole perovskite oxide p-i-n junctions aimed for developing three terminal devices are prepared by means of pulsed laser deposition on  $SrTiO_3$  substrate, for which the p-area is the semiconducting  $(La_{1-x}Sr_x)MnO_3$  (LSMO) with  $x \sim 0.1-0.2$ , the n-area is the electron-doped cuprate superconductor  $(La_{1-x}Ce_x)_2CuO_4$  (LCCO), and the oxide ferroelectric  $(Ba_{1-x}Sr_x)TiO_3$  (BST) is inserted in between LSMO and LCCO layers as the depletion layer. The key problem for the fabrication is to solve the contradiction of reduction treatment for the as-deposited LCCO layer and full oxidization treatment for the as-deposited LSMO layer in the deposition process to get high quality multilayer. It is found that the rectification of such p-i-n junctions is strongly dependent on the thickness of BST layer. The largest rectification corresponds to the case that the thickness of BST layer must be identical to that of depletion layer between n-LCCO and p-LSMO layers.