P90

Effect of magnetic field on high conductivity area at the interface of heterostructure $Ba_{0.8}Sr_{0.2}TiO_3/LaMnO_3$

D.P. Pavlov, N.N. Garig'yanov, A.V. Leontyev, D.K. Zharkov,
T.M. Salikhov, V.V. Kabanov, R.F. Mamin

Zavoisky Physical-Technical Institute, FRC Kazan Scientific Center of RAS, 420029, Kazan, Russia
dmitry.p.pavlov@gmail.com

A high-mobility electron gas was observed in 2004 [1] at the interface of heterostructure $LaAlO_3$ (LAO) and $SrTiO_3$ (STO). It has been shown that analogous to the ionic polar discontinuity, that this state may be created at an interface due to electric polarization discontinuity [2, 3]. A quasi two dimensional electronic gas (q2DEG) is formed in the STO layers next to the interface which becomes superconducting below a temperature of 300 mK [1, 4]. Ferroelectrics are attractive materials for such kind heterostructure creation, because ferroelectrics have an electric polarization. And one of more useful material for that is $Ba_{0.8}Sr_{0.2}TiO_3$ (BSTO). As substruct we use $LaMnO_3$ (LMO), because antiferromagnetic $LaMnO_3$ (LMO) might be transferred to ferromagnetic state by increasing the concentration of free carriers by injection. This means that increasing the free change carriers might lead to the local ferromagnetic state and magneto-resistivity in a system with q2DEG. Therefore, there is an opportunity to switch conductivity by a magnetic field, if the magnetic order will be realized in the interface of heterostructure BSTO/LMO due to screening of ferroelectric polarization. The thin film of epitaxial $Ba_{0.8}Sr_{0.2}TiO_3$ (BSTO) was sputtered on the top of single crystalline $LaMnO_3$ samples using the magnetron sputtering technique. Conductivity measurements were performed by a four-point probe method. Measurements were performed before and after effect of magnetic field on BSTO/LMO heterostructure. We have shown that when a magnetic field is applied time-by-time to heterostructure during *c*-axis of LMO, the resistivity is decreasing and maximum of resistivity on temperature shift on more high temperature up to the some temperature of maximum. Thus if at the beginning the maximum was at 160 K in the final case we get the temperature of maximum about 240 K. Under future application of magnetic field the temperature of maximum is not change.

The reported study was funded by Russian Scientific Foundation, research project No. 18-12-00260.

1. A. Ohtomo, H. Hwang, *Nature* **427**, 6973 (2004).
2. M. K. Niranjan, Y. Wang, S.S. Jaswal, E.Y. Tsymbal, *Phys. Rev. B* **103**, 016804 (2009).
3. K.D. Fredrickson, A. Demkov, *Phys. Rev .B* **91**, 115126 (2015).
4. N. Reyren, S. Thiel, A. Caviglia et al., *Science* **317**, 5842 (2007).