EPITAXIAL HETEROSTRUCTURE OF A CUPRATE SUPERCONDUCTOR AND PRASEODYMIUM NICKELATE

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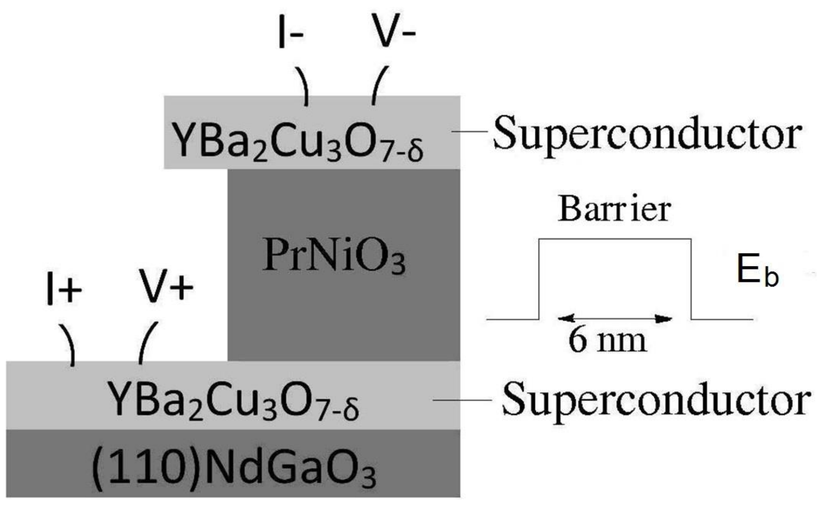
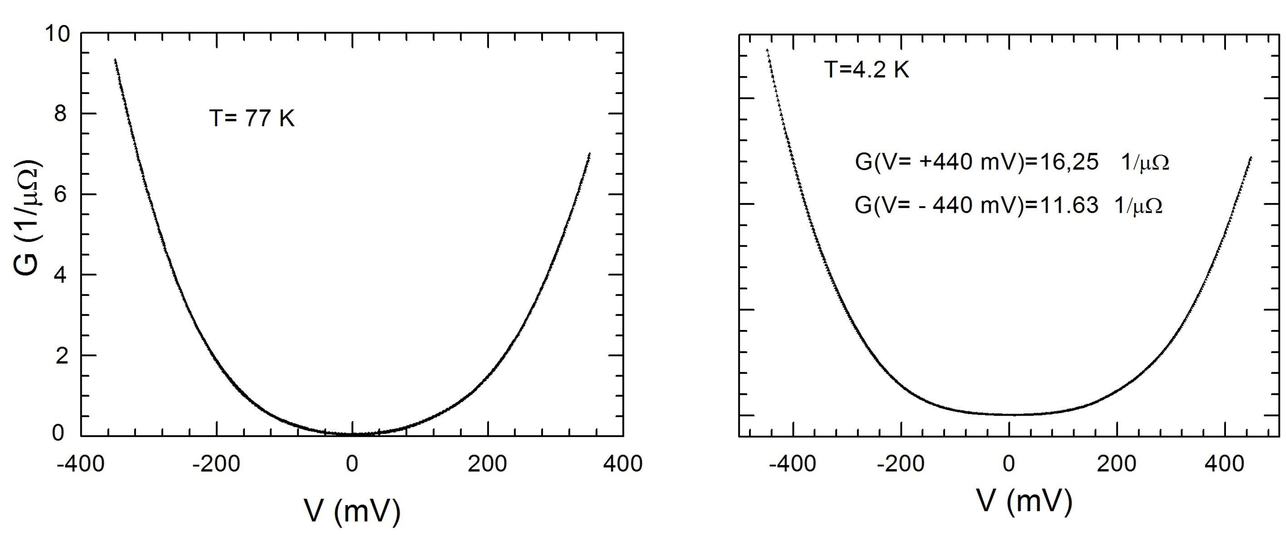
Heterostructures with epitaxial interfaces of transition metal oxides with superconducting properties and materials with strain-controlled characteristics, in particular with nickelates, attract an increased interest due to opportunities for development of electronic devices with spin polarized electron transport [1]. As far, we report on the first experimental data on the XRD and resistive characteristics of epitaxial $YBa_2Cu_3O_{7-x}/PrNiO_3/YBa_2Cu_3O_{7-x}$ heterostructure with the 6 nm thick praseodymium nickelate, $PrNiO_3$, interlayer. Five structures were fabricated on one substrate with square geometry and widths 10 … 50 mm. With decreasing temperature, the voltage dependence of the conductivity, G(V), shows deviation from the symmetric one, becoming noticeable already at T = 77 K, the temperature lower than the critical temperature of cuprate superconductor $YBa_2Cu_3O_{7-x}$. This hints on appearance of spin-polarized electron transport in heterostructure.

1. S. Catalano, et al., Rep. Prog. Phys. **81,** 046501(2018)

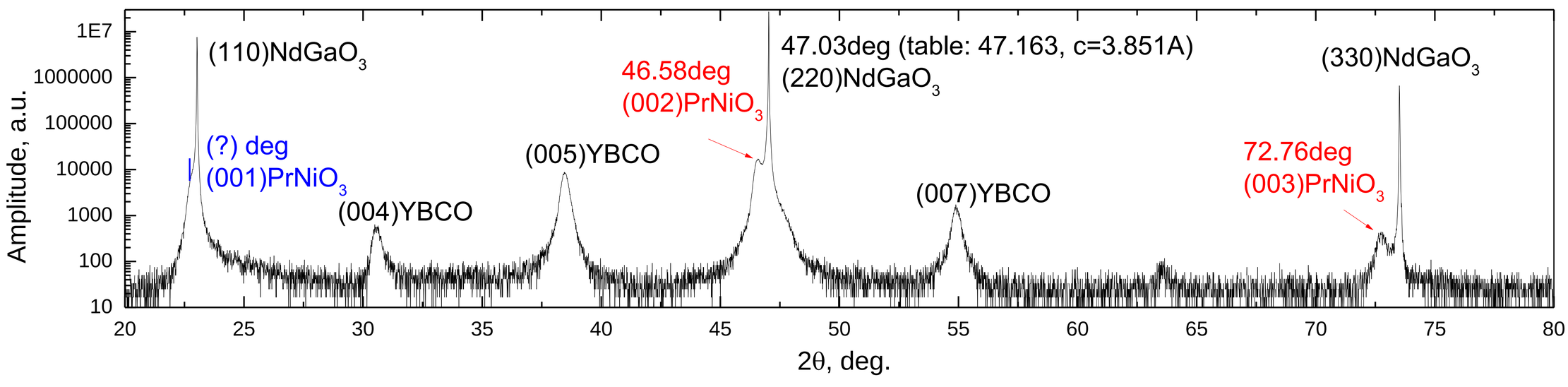
Heterostructure on $NdGaO_3$ substrate



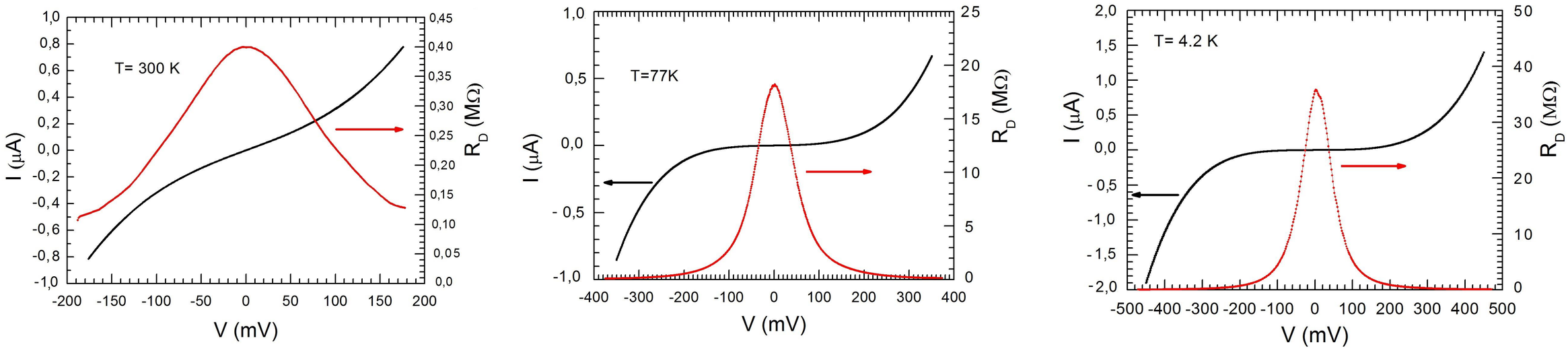
Conductance for 40x40 μm² sample



XRD Θ/2Θ symmetric scan



I-V evolution with temperature



Conclusions

The $YBa_2Cu_3O_{7-x}/PrNiO_3/YBa_2Cu_3O_{7-x}$ heterostructures were fabricates and characterized by XRD, and voltage dependencies of conductance at temperatures T=300, 77, and 4.2 K. An asymmetry in G(V) functions has been registered: at T=77 K the ration g=G(-330 mV)/G(+330 mV) was 32%, at T=4.2 K g=40 %. However, further studies are needed in order to reveal the impact of praseodymium nickelate barrier at reduced temperatures.