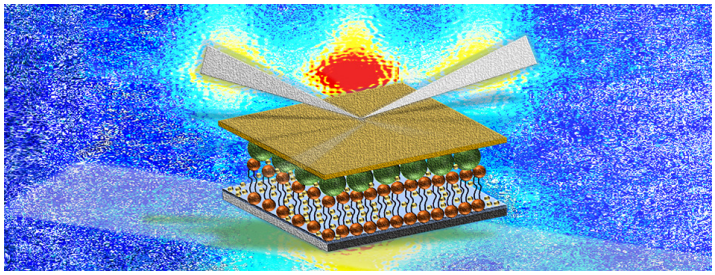

Beitrag ID: **48** Typ: **Poster**

Anomalous magnetoresistance driven by interfacial proximity in superconductor/ferromagnet heterostructures

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Proximity effects (PE) are emergent phenomena that occur at the interfaces of appropriately designed superconductor (SC)/ferromagnet (FM) thin films heterostructures. PE arise due to the strong correlation and electronic competition in the antagonist phase materials. PE have potential applications in spin-triplet Josephson Junctions that involve the manipulation of fluxons, such as superconducting Qubits, for quantum computing [1–3]. Several types of PE were reported when considering heterostructures based on conventional SC and FM with either in-plane or perpendicular magnetic anisotropy (PMA). However, there are few contributions regarding PE in heterostructures based on high critical temperature (T_c) SC and FM with perpendicular magnetic anisotropy. $SrRuO_3$ (SRO) is a suitable FM candidate due to its strong PMA with narrow domain walls, high spin-orbit coupling, anomalous Hall and Berry effects, and excellent lattice match with the high-T_c SC $YBa_2Cu_3O_{7-x}$ (YBCO). We report magnetotransport results of epitaxial YBCO/SRO and SRO/YBCO heterostructures prepared on low miscut $SrTiO_3$ (001) single crystals by high oxygen pressure sputtering. We have observed intriguing proximity effects characterized by (i) a reduction in the SC T_c and (ii) an inversion of the magnetoresistance (MR) signal at the superconductivity onset. We suggest that the change in the MR signal is related to the competition between the FM and SC states within both samples. In addition, features in the MR curves that may be attributed to weak localization and antilocalization effects at the YBCO/SRO and SRO/YBCO interfaces were observed. Such features could be correlated to the high Ru deficiency in the SRO films and to a possible orbital reconstruction at the interfaces, which will be further investigated by synchrotron and neutron scattering techniques. This study enhances our understanding of the intricate relationship between magnetism and superconductivity in high-T_c SC/FM systems, illuminating potential future materials for quantum electronics.

[1] Sedlmayr, N., & Levchenko, A., Solid State Communications, 327, 114221 (2021).

[2] Dua, A., Malomed, B., Cheng, M., & Jiang, L., Physical Review B, 100, 144508 (2019).

[3] Klenov, N. V., Kuznetsov, A. V., Soloviev, I. I., Bakurskiy, S. V., Denisenko, M. V., & Satanin, A. M., Low Temperature Physics, 43, 789-798 (2017).

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