Wednesday 18 May at **3:00 PM**
Mengying Tang (Master Student at RWTH-Aachen and JCNS-2)
Project Colloquium

Title: Study of microstructural, magnetization and electrical transport properties in YBCO/FePd heterostructures

Abstract: The superconducting and ferromagnetic phases are fundamental and are direct macroscopic manifestations of many-body quantum physics. However, these two phases are largely incompatible. Furthermore, the interaction between superconducting and magnetic-order parameters at the mesoscopic length scale may lead to new physical phenomena [1, 2, 3].
In this talk we will present the important features of hybrid Superconductor (S)/ferromagnetic (F) systems, more precisely YBCO/FePd heterostructures, such as the microstructure, magnetization and electrical transport properties and a comparison with ferromagnetic thin films. Our samples were produced by a combination of high oxygen pressure sputtering (HOPS) system and ultra-high vacuum molecular beam epitaxy (MBE). The samples' structural, magnetic and electrical transport properties were characterized by in-house techniques, such as, X-ray diffraction, magnetic force microscopy, magnetometry and resistivity. For both groups of samples, epitaxial growth on the MgO substrate were achieved with good quality. However, when FePd is deposited on YBCO, the FePd is shown to be polycrystalline from the RHEED pattern. FePd on MgO shows good perpendicular magnetic anisotropy with maze domain pattern, while the FePd on YBCO group does not show any magnetic domain pattern in out-of-plane direction. In the electrical transport measurements, the degradation of YBCO with the increase of FePd deposition temperature led to the loss of superconductivity.

References:
[1] Annika Stellhorn, Tailoring superconducting states in superconductor-ferromagnet hybrids, New J. Phys. 22 (2020) 093001, doi: 10.1088/1367-2630/abaa02
[2] Zhaorong Yang, Domain-wall superconductivity in superconductor–ferromagnet hybrids, Nature Publishing Group: 3 October 2004, doi:10.1038/nmat1222 .
[3] Matthias Eschrig, Spin-polarized supercurrents for spintronics, Physics Today 64(1), 43 (2011); doi: 10.1063/1.3541944