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Supercurrent and transport properties of mesoscopic SNFS Josephson junction under the injection of spin polarized current

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Mesoscopic hybrid planar Josephson junctions have attracted a lot of interest in the recent decade in terms of their possible applications in the electronics, spintronics, quantum computing and fundamental research. We have investigated the transport properties of Josephson junctions based on superconductor – normal metal/ ferromagnet – superconductor (Al-Cu/Fe-Al) with double layered N/F weak link (Cu/Fe) under the controllable spin polarized current injection at low temperatures and in weak magnetic fields. Spin polarized current was injected in the middle of the Josephson junction from the perpendicular ferromagnet electrode. We have observed the supercurrent in this type of junctions show nonlinear dependence of low values injection current from F-electrode. We claimed that this effect is due to $0-\pi$ transition, i.e. the fundamental Josephson relation can be changed from $I=I_c \sin \Phi$ to $I=I_c \sin (\Phi+\pi)$ by controlling not only energy distribution as it was done in but also with the presence of spin polarization of the injection current. Our experiments also demonstrated the appearance of double-peak peculiarity in differential resistance at high values of the injection current which is assumed to be due to the double proximity effect.

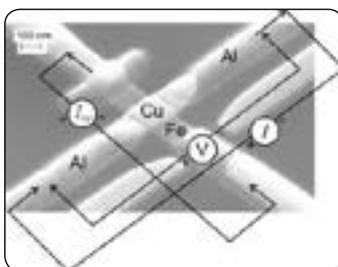


Figure 1: SEM image of the multiterminal Al-(Cu/Fe)-Al Josephson junction together with the measurement scheme.

Recent Publications

1. F J Jedema et al. (2002) Electrical detection of spin procession in a metallic mesoscopic spin valve. Nature. 416:713-716.
2. T Yu Karminskaya et al. (2010) Josephson effect in superconductor/ferromagnet structures with a complex weal link region. Phys. Rev. B. 81:214518.
3. T E Golikova et al. (2012) Double proximity effect in hybrid planar superconductor (normal/metal/ferromagnet)-superconductor structures. Phys. Rev. B 86:064416.

Biography

Golikova T E obtained her PhD Degree in Physics in 2014 and she is working on experimental investigation of the interplay of superconductivity and magnetism at low temperatures involving structure fabrication with the nanotechnology tools. Her research interest include: superconductivity and magnetism, spintronics, Josephson junctions.

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