SFB 608

Einladung zum Kolloquium

Ort: Universität zu Köln
II. Physikalisches Institut, Seminarraum 201

Zeit: Mittwoch, den 29. Januar 2003, 15 Uhr c.t.

Sprecher: Dr. Natalia Pavlenko

Thema: Electronic Charge-Polarization Coupling in Superconductor-Ferroelectric Superlattices.

I present a theory of periodic ferroelectric-superconductor (FE-S) heterostructures containing ferroelectric (FE) layers sandwiched between superconducting planes. I analyse the electronic charge carrier redistribution at the FE-S interface in the presence of spontaneous polarization in the ferroelectric layer. On the other hand, I study the influence of the superconductor on the structural dynamics in the ferroelectric layer. The effect of FE-S contacts on the ferroelectrics is found to be crucial leading to a structural transformation from the state with the homogeneous-type polarization to the phase with a set of asymmetric stable polarization domains. FE-S interface phenomena induce a decrease of the temperature of the transition to the symmetric phase with two symmetric (negative and positive) polarization domains. Nevertheless, even above the ferroelectric critical temperature I find in the ferroelectric layer a stable contact-induced enhanced spontaneous polarization. The domain structure in the symmetric phase appears as the response to the charge carrier redistribution at the contact with the superconducting subsystem. An increase of the FE-S interface coupling results in a complex nonmonotonic behaviour of the superconducting transition temperature and finally, for the strong-coupling regime, in a complete suppression of the superconductivity. The results are expected to be especially important for the analysis of high-temperature cuprate superconductor films grown on perovskite-type ferroelectrics.

Gez. Prof. Th. Nattermann