Thesis Title Calculation of the Net Tunneling Electric Current in S'-I-S Junction

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Abstract

The transmission coefficients for the S'-I-S system are calculated by using the boundary value treatment. It is assumed that the carriers are both electrons and holes. The calculated coefficients is found to be related to the BSC density of states. Since these coefficients appear in the integral expression for the net tunneling current, the tunneling currents for the S'-I-S systems are also related to the BSC density of states. The integrals are evaluated numerically to yield a "predicted" net electric current for the S'-I-S junctions. The "predicted" current-voltage curves are in very good agreement with experimental results found in the literature. The only adjustments needed for the curve fitting are the values of the wave vector within the insulator layer in the junction.The order of magnitude of the tunneling current for applied voltages in the millivolt range are in exact agreement with the observed magnitudes. The agreement appears for S and S' being either high T_c superconductors or being conventional superconductors. The calculated tunneling currents for S'-I-S and S'-I-S systems are also analysed as a function of the imaginary part of the insulatior wave vector k, the insulator thickness L, the energy gaps and the critical temperatures of S' and S.