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Dimensional effects in V/Cu superconducting superlattices

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Abstract

The superconductor-normal-metal phase transitions in V/Cu superlattices have been studied in parallel and perpendicular magnetic fields. Two crossovers from three-dimensional to two-dimensional and from two-dimensional to three-dimensional have been observed in magnetoresistance R(H,T) and in dependencies of the fluctuating conductivity σ'(T) in a parallel magnetic field. The crossover in low magnetic field is caused by the fact that the superconducting coherence length $\xi_S(T)$ becomes of the order of the superstructure period Λ. The crossover in high magnetic field is due to the competition of the normal-metal coherence length ξ_N and magnetic length L_H. The experimental results are in good agreement with numerical solution of the Ginzburg-Landau equation for superconductor-normal-metal-superconductor (SNS) superlattices.