

Superconductor – Insulator Transitions in Pure Polycrystalline Nb Thin Films

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We report on a study of the transport properties of Nb thin films. By varying the thickness of the films from 250 Å to 25 Å, we observed a depression of the superconductivity. Magnetic field was also applied up to 6 T, inducing the disappearance of the superconductivity and the onset of an insulating behavior. We have compared the analysis of these superconductor-to-insulator transitions (SIT) according to two models. The first, based on Finkel'stein's explanation of the destruction of superconductivity, implies the weakening of the amplitude of the superconducting order parameter. The second, based on the universality of the system's behavior near continuous quantum critical points, implies the destruction of the superconducting phase order. The results were compared to those we have already obtained on a highly disordered system, a-NbSi, to understand whether the same mechanisms for the disappearance of the superconductivity could be at play in pure metallic thin films and in highly disordered systems. Finally we have inferred the phase diagram for Nb thin films in the thickness-magnetic field plane.