Superconductor-insulator quantum phase transition in amorphous InOx at elevated pressures

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Numerous studies have been made on the superconductor-insulator quantum phase transition (SIT). In most of the experiments the transition is approached by varying stoichiometry, thickness and magnetic field. On the other hand, studies using pressure as a control parameter are still lacking.

InOx is a well-studied material which exhibits SIT in thin films which can be considered as 2 dimensional. At high oxygen concentrations the resistivity diverges at low temperatures whereas below some critical concentration InOx becomes superconducting. Moreover, in the vicinity of the critical concentration the superconducting InOx exhibits magnetically driven transition into the so-called "super insulating" state with a well-defined temperature independent critical magnetic field, which is unique for each oxygen concentration.

Here, we present our electrical transport and structural study of a 3 dimensional InOx powder at elevated pressures, low temperatures and under magnetic fields. The transport measurements suggest that there is a critical pressure above which the insulating InOx becomes superconducting. The superconducting InOx has also a critical magnetic field above which the system becomes insulating. Our synchrotron XRD measurements show no structural phase transition at the studied pressure range, implying that the observed SIT doesn't stem from a structural change. The features of the SIT at elevated pressures in comparison with the ambient pressure case will be discussed.