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Theory of Giant Magnetoresistance Peak in InO Superconducting Films ANIRBAN GANGOPADHYAY, JOE MITCHELL, VICTOR GALITSKI, University of Maryland, College Park, MARKUS MUELLER, The Abdus Salam International Centre for Theoretical Physics — It has been suggested that the giant magnetoresistance peak seen on the insulating side of a superconductor-insulator transition in In_2O_{3-x} films is a signature of remanant localized pairs which can participate in variable-range-hopping transport. A theory of pair-transport must necessarily take into account the bosonic nature of the pairs, as opposed to the fermionic nature of single-electron carriers. We show that this opposite statistical nature of the carriers alone can lead to opposite variations of the localization length with magnetic field and thus be a possible candidate for explaining the giant magnetoresistance peak. We further provide an explanation of the pairing mechanism in In_2O_{3-x} films. We argue that the electron pairing mechanism here is non-BCS-type and is related instead to the local effect of electron pairs occupying Oxygen vacancies (with charge +2e). The neutral state of these defects may be more stable than the singly-charged defect, as supported by an ab initio analysis. This simple phenomenon leads naturally to a negative-U Hubbard model with strong disorder.

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