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Size dependent transport of amorphous Indium Oxide films. SWATI SOMAN, DAN SHAHAR, Weizmann Institute of Science, Israel. — Superconductivity in presence of disorder is a topic of interest among experimentalists as well as theoreticians for past several decades. Experiments performed on disordered films of various materials, elemental as well as mixture, have demonstrated Superconductor to Insulator transition (SIT) with increase in disorder or externally applied magnetic field. Disorder is difficult to quantify. However, in an experiment it is controlled by tuning film thickness and/or composition. We present experimental evidence of SIT, in disordered, amorphous Indium Oxide (a:InO_x) films, which is tuned by films' lateral dimensions. By fabricating films of same thickness and composition in Hall bar geometry and changing only the sizes of Hall bars, we observe that the sheet resistance per square, R changes with the size of the square, contrary to its definition. The systematic dependence of R on square size is observed to occur only for a critical disorder, similar to percolation model. The observations suggest an inhomogeneous nature of transport near SIT in our samples which are found to be structurally homogeneous. We postulate that such size dependent transport properties are possible to observe in disordered films of other materials that exhibit SIT.

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