Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Semiconductor- to Metallic-like Behavior in Bi Thin Films Deposited on (100) KCl Substrate THANH NHAN BUI, IMCN/NAPS, JEAN-PIERRE RASKIN, ICTEAM/ELEN, BENOIT HACKENS, IMCN/NAPS — Bi thin films, with a thickness of 100 nm, are deposited by electron-beam evaporation on a freshly cleaved (100) KCl substrate. The deposition temperature ranges from room temperature up to 170 °C. Scanning electron microscopy reveals that films deposited at room temperature present a maze-like microstructure on its surface typical of the rhombohedral (110) texture as confirmed by X-ray diffraction. By heating the substrate to a temperature above 80 °C during the deposition, another microstructure appears characterized by concentric triangular shapes corresponding to the trigonal texture. Temperature dependence of the resistivity from room temperature down to 10K shows a semiconductor-like behavior for films deposited at room temperature and a metallic-like behavior for films deposited above 80 °C. From low temperature magnetoresistance measurements (at 10K and up to 6 T), we extract the electronic transport parameters (mobility and charge carrier concentration). These data, together with the average grain size, help us provide an explanation for the transition between both behaviors.

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Date submitted: 13 Nov 2014 Electronic form version 1.4