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Magnetoresistence Measurements of Textured and Non-Textured Bismuth Thin Films ALBERT LIAO, MIT, MENGLIANG YAO, Boston College, FERHAT KATMIS, SHUANG TANG, JAGADEESH MOODERA, MIT, CYRIL OPEIL, Boston College, MILDRED DRESSELHAUS, MIT — Bismuth has recently received renewed interest because it is a key ingredient of many thermoelectric materials. Previous studies focus on bulk and/or single crystalline samples. However for thermoelectrics, it is desirable to assemble nano-structures to create a high ZT material. The way these nano-elements are assembled can be tuned to develop desirable properties. We control the texture of Bi films during thermal evaporation or molecular beam epitaxy, by using different growth substrates. Films deposited on mica, create a mosaic texture with the trigonal axis pointing out of plane. Films made on SiO_2 are polycrystalline with grains oriented in random crystallographic direction. We measure magnetoresistance (MR) from 3-300 K while rotating our films in a magnetic field in two configurations. One where the current rotates with the plane of the film, and one where the current flows is always perpendicular to the field. We observe large discrepancies in MR behavior between the different samples at < 100 K. Most surprisingly, we detect a MR when the current is supposedly parallel to the field in the non-textured film, inferring the current is not always traveling along the plane of the film. This may indicate the existence of planes within grains in which the carriers prefer to move.

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