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The Design and Fabrication of Bismuth Hall Effect Biosensors
ANTHONY SIGILLITO, Department of Physics, University of Dallas 75062, MARTIN RUDOLPH, VICKI SOGHOMONIAN, J.J. HEREMANS, Department of Physics, Virginia Tech 24060 — Because of their high sensitivity, accuracy, and low cost, the use of Hall biosensors promises to be an effective diagnostic technique that may aid in the early diagnosis of diseases. In this research, Hall sensors were fabricated from thermally evaporated bismuth thin films. The bismuth films were deposited under high vacuum onto heated Si/SiO_2 substrates using a two layer deposition technique. The films varied in thickness from 60 nm to 75 nm and were etched into Hall bar geometries using photolithography and wet chemical etching. Magnetoresistance and Hall measurements were taken from 4 K to 300 K. The data indicate that the sensors may be characterized using a two carrier model with high mobility, low density holes and low mobility, high density electrons. Additionally, the sensors were exposed to magnetite nanoparticles and characterized using atomic force microscopy. The results will be reported. This research was funded by the National Science Foundation (NSF Grant DMR-0851662).

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