Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Properties of superconducting Pb/Bi films modulated by a periodic magnetic stripe pattern ZUXIN YE, KYONGWAN KIM, I. LYUKSYUTOV, WENHAO WU, D.G. NAUGLE, Texas A&M University — Rectangular Pb/Bi patterns with four contact leads were defined on Si wafers by e-beam lithography. Pb/Bi films with thickness $\sim$ 100 nm were deposited by evaporation with the substrates held at liquid nitrogen temperature. Ge layers of thickness $\sim$ 20 nm were then deposited as a spacer layer. Parallel Ni stripes were patterned by e-beam lithography and deposited by e-beam evaporation on the top of the Ge spacer layer. The width of the stripes was 120 nm and the spacing was 500 nm. The thickness of Ni layer was 120 nm. Electron transport properties were investigated in two types of samples, with the current applied parallel (the parallel samples) or perpendicular (the perpendicular samples) to the Ni stripes. Hysteretic superconducting properties under a magnetic field were observed in both types of samples. An anomalous magneto-resistance exceeding the normal state resistance was observed in the perpendicular samples at certain temperature and magnetic field range. A strong enhancement in critical current was observed in the parallel samples at higher temperatures. The experimental data was compared with the recent theories of magnet-superconductor hybrids. This work was supported by DOE No. DE-FG02-07ER46450, NSF CHE-0809651, the Robert A. Welch Foundation A-0514 and A-1688, and NHARP under grant # 010366-0039-2007.

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Date submitted: 14 Dec 2009 Electronic form version 1.4