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Exchange Bias and Magnetotransport in Permalloy Connected Kagome Artificial Spin Ice BRIAN LE, University of Illinois at Urbana-Champaign, DAVID RENCH, RAJIV MISRA, Pennsylvania State University, LIAM O'BRIEN, CHRIS LEIGHTON, University of Minnesota, NITIN SAMARTH, Pennsylvania State University, PETER SCHIFFER, University of Illinois at Urbana-Champaign — Artificial spin ice consists of nanoscale ferromagnets arranged in a periodic lattice, with the resultant magnetostatic interactions emulating the local magnetic behavior of spin ice. Kagome artificial spin ice consists of elongated ferromagnetic islands or nanowires arranged in a honeycomb lattice. We present magnetotransport results in connected kagome artificial spin ice composed of permalloy ($Ni_{81}Fe_{19}$) nanowires. Magnetoresistance was measured as a function of applied field strength at different temperatures. At temperatures below 20 K, the field reversal symmetry of the magnetoresistance is broken. This asymmetry appears to be associated with exchange bias due to the surface oxidation of permalloy and is suppressed in aluminum-capped samples. These results signify that exchange bias can play a substantial role in the physics of artificial spin ice that has potential as a new mode of controlling its behavior. Supported by the US Department of Energy, Office of Basic Energy Sciences, Materials Sciences and Engineering Division under grant number DE-SC0010778. Work at the University of Minnesota was supported by the NSF MRSEC under award DMR-0819885 and a Marie Curie International Outgoing Fellowship within the 7th European Community Framework Programme (project no. 299376).

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