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Exploration of thermal conductivity, Seebeck coefficient, and Lorenz number deviations in Ni-Fe alloy films[1] B.L. ZINK, A.D. AVERY, R. SULTAN, D. BASSETT, G. COTTERIL, University of Denver — As electronic and spintronic systems continue to shrink, exploration of the fundamental physics affecting thermal transport in prospective materials becomes increasingly essential. For example, the potential use of spin-torque driven domain wall motion in ferromagnetic nanowires as a memory element requires application of large current densities to these tiny structures. The resulting heating could have both helpful and harmful effects, and is in general not yet well-understood. This is partly due to a gap in the fundamental knowledge of thermal properties of nanoscale systems that is due to the challenging nature of the necessary measurements. We have recently developed a micromachined thermal isolation platform that allows measurement of thermal conductivity, electrical conductivity, and thermopower (or Seebeck effect) in thin film systems. In this talk we present our recent data on thermal conductivity, resistivity, and Seebeck coefficient, for Ni-Fe alloy films with thicknesses varying from 25-100 nm. We compare our results to the predictions of the Wiedemann-Franz law and discuss variations represented by deviations from the Sommerfeld value of the Lorenz number, and conclude with our plans to extend the technique to yet smaller structures.

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