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Separation of the inverse spin Hall effect and anomalous Nernst effect in a single ferromagnetic metal using on-chip spin Seebeck devices[1] STEPHEN WU, JASON HOFFMAN, JOHN PEARSON, ANAND BHATTACHARYA, Argonne National Laboratory — The longitudinal spin Seebeck effect is measured on the ferromagnetic insulator Fe_3O_4 with the ferromagnetic metal $Co_{0.2}Fe_{0.6}B_{0.2}$ (CoFeB) as the spin detector in a micro-patterned device structure using an on-chip heater. By using a non-magnetic spacer material between the two materials (Ti), it is possible to decouple the two ferromagnetic materials and directly observe pure spin flow from Fe_3O_4 into CoFeB. It is shown, that in a single ferromagnetic metal the inverse spin Hall effect (ISHE) and anomalous Nernst effect (ANE) can occur simultaneously with opposite polarity. Using this and the large difference in the coercive fields between the two magnets, it is possible to unambiguously separate the contributions of the spin Seebeck effect from the ANE and observe the degree to which each effect contributes to the total response within a single experiment. Additionally, by using the spin detector layer as a thermometer, an accurate value for the thermal gradient across the device can be measured. These results match well with thermal simulations of our device structure.

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