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Thermopower and Anomalous Nernst coefficients of binary ferromagnetic alloys $\mathbf{Fe}_{1-x}\mathbf{Co}_x$ and $\mathbf{Ni}_{1-x}\mathbf{Cr}_x$[1] YUANHUA ZHENG, MICHAEL ADAMS, NICOLAS ANTOLIN, WOLFGANG WINDL, JOSEPH HEREMANS, Ohio State Univ - Columbus — We report the results of magnon-drag thermopower in binary alloys $Fe_{1-x}Co_x$ and $Ni_{1-x}Cr_x$. Fe-Co and Ni-Cr alloys are ferromagnets in which magnons are involved in the transport of electrons and induce an additional thermopower by drag effects. The drag effect increases the thermopower by an order of magnitude. A recently developed theory (1) predicts that magnon drag thermopower of elemental 3-d metals is inversely proportional to the number of s and p electrons while the sign is determined by the sign of the effective mass of majority carriers. Combining this theory with our orbitally-resolved band structure calculation of the DOS of the alloys, we predict a change of sign of the thermopower of the Fe-Co alloys with x, and the magnitude of their thermopower. We synthesize the alloys and measure the temperature dependence of their resistivity, thermopower and Nernst coefficients from 77 to 1000 K. We find that magnon-drag contributes greatly to the thermopower and the predictions about sign are verified experimentally. We further extend our research to $Ni_{1-x}Cr_x$ alloys. Thermoelectric metals require different device design than conventional materials. Here we propose a thermoelectric combustion chamber. (1) S. J. Watzman, et al. PRB (2016).

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