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Intermediate Valence Tuning and Seebeck Coefficient Optimization in Yb-based Low-Temperature Thermoelectric Materials[1] GLORIA LEHR[2], DONALD MORELLI[3], Michigan State University, HYUNGYU JIN[4], JOSEPH HEREMANS[5], Ohio State University — Several Yb-based intermediate valence compounds have unique thermoelectric properties at low temperatures. These materials are interesting to study for niche applications such as cryogenic Peltier cooling of infrared sensors on satellites. Elements of different sizes, which form isostructural compounds, are used to form solid solutions creating a chemical pressure (smaller atoms – Sc) or relaxation (larger atoms – La) to alter the volume of the unit cell and thereby manipulate the average Yb valence. Magnetic susceptibility measurements show a strong correlation between the Seebeck coefficient and the ratio of trivalent to divalent Yb in these compounds. Two different Yb-based solid solution systems, $Yb_{1-x}Sc_xAl_2$ and $Yb_{1-x}La_xCu_2Si_2$, demonstrate that the concentration of Yb can be used to tune both the magnitude of the Seebeck coefficient as well as the temperature at which its absolute maximum occurs.

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[2]Department of Chemical Engineering & Materials Science
[3]Department of Chemical Engineering and Materials Science, Department of Physics and Astronomy
[4]Department of Mechanical and Aerospace Engineering
[5]Department of Mechanical and Aerospace Engineering, Department of Physics

Gloria Lehr
Michigan State University

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