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New insights into rare-earth intermetallic alloys for cryogenic Peltier cooling[1] STEPHEN BOONA, DONALD MORELLI, Department of Chemical Engineering and Materials Science, Michigan State University — Strongly correlated materials such as intermediate valence $CePd_3$ have long been considered attractive candidates for cryogenic Peltier cooling due to the combination of metallic electrical resistivity concurrent with Seebeck coefficient values on the order of 100 μ V/K at low temperatures. This behavior is a direct result of the strong hybridization of localized 4f states with delocalized conduction electrons, which gives rise to several unusual structural, electronic, thermal, and magnetic properties. Our recent work on this compound has helped to unravel some of the complex ways in which these properties are correlated, and we have successfully utilized this improved understanding to enhance ZT up to 0.3. We present a broad overview of these new insights and provide suggestions for how they may be exploited to achieve enhanced thermoelectric performance in other strongly correlated materials.

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