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Gigantic enhancement of spin Seebeck effect by phonon drag HIROTO ADACHI, Japan Atomic Energy Agency, KEN-ICHI UCHIDA, EIJI SAITOH, Tohoku University, JUN-ICHIRO OHE, Japan Atomic Energy Agency, SABURO TAKAHASHI, Tohoku University, SADAMICHI MAEKAWA, Japan Atomic Energy Agency — We investigate both theoretically and experimentally a gigantic enhancement of the spin Seebeck effect [K. Uchida et al., Nature 455, 778 (2008); C. M. Jaworski et al., Nature Mater. 9, 898 (2010); K. Uchida et al., Nature Mater. 9, 894 (2010)] in a prototypical magnet $LaY_2Fe_5O_{12}$ at low temperatures. Our theoretical analysis sheds light on the important role of phonons; the spin Seebeck effect is enormously enhanced by nonequilibrium phonons that drag the low-lying spin excitations. We further argue that this scenario gives a clue to understand the observation of the spin Seebeck effect that is unaccompanied by a global spin current, and predict that the substrate condition affects the observed signal.

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