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Spinon and Phonon Seebeck Effects

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Generation and utilization of a flow of spin angular momentum of electrons in condensed matter, called spin current, are the key challenge of today's nano-scale magnetism and spintronics. The discovery of the inverse spin Hall effect (ISHE) [1], the conversion of spin current into electric voltage via spin-orbit interaction, has allowed researchers to detect and utilize spin current directly, and, since then, many spin-current driven effects have been discovered by exploiting the ISHE. In my talk, I will give an introduction to the following topics: (1) Spin-Liquid spin current carried by spinons [2], (2) Phonon anomaly in spin Seebeck effects [3], and (3) Spin current coupled with mechanical motion [4], to discuss the general mechanism of spin-current interaction. [1] E. Saitoh et al., Applied Physics Letters 88 (2006) 182509. [2] D. Hirobe et al., Nature physics (2016) published online. [3] T. Kikkawa et al., Physical Review Letters 98 (2016) in press. [4] R. Takahashi et al., Nature physics 12 (2015) 52.