< Thermal Spin Power without Magnets >

Gongjun Choi

< Abstract >

As a counterpart of the Seeback effect, "the spin Seeback effect" was discoverd by Jaworski a few years ago. Spin current induced by a temperature gradient applied to a magnet can be converted into a measureable voltage, and the efficiency of the effect is described by the spin Seeback coefficient. Jaworski thereafter succeeded in showing that magnets are not needed to observe the spin Seebeck effect, and its coefficient turned out to be 1,000 times larger than the previous one. On his encountering this result, Jaworski took the advantage of the spin imbalance, temperature difference between the electrons and phonons, and spin-orbit interaction to provide a reasonable explanation. Apart from the large spin coefficient, the associated symmetry breaking is discussed, and this provides a hint for possibility of making the spin Seeback effect without a magnetic field with the link of the spin orientation to the direction of electron motion in the surfaces of topological insulators. On the other hand, it still remains unsolved to demonstrate the relation between the strength of magnetic field and temperature range where the effect occur. Furthermore, in accordance with the fact that both of the spin Seeback and topological properties are due to spin-orbit coupling, the former is expected to be helpful in understanding the later. In sum, out discussion will be mainly focused on "the spin Seebeck effect" and physical problems which the effect includes.