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Spin-current phenomena at high magnetic fields and high temperatures

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In the field of spintronics, many experimental and theoretical studies have been focused on spin-transport phenomena in paramagnet/ferromagnet junction systems, where a spin current plays a central role. After the first demonstration of spin transport in insulator-based systems [1], a Pt/YIG junction system becomes one of the prototype samples. In this system, itinerant spins in Pt and localized magnetic moments in YIG interact with each other via the interface s-d interaction, i.e., the spin-mixing conductance; this interaction is the basic mechanism underlying various spin-current-related phenomena, such as the spin pumping [1], the spin Seebeck effect [2], and the recently-discovered spin Hall magnetoresistance (SMR) [3]. In this talk, we report the observation of the longitudinal spin Seebeck effect (LSSE) [4] and the SMR in Pt/YIG systems at high magnetic fields and high temperatures. The LSSE measurements in a high magnetic field range confirm that the observed voltage in the Pt/YIG systems is of magnon origin, providing a useful way to distinguish the LSSE from the anomalous Nernst effect induced by proximity ferromagnetism in Pt [5]. The LSSE and SMR at high temperatures highlight the importance of the temperature dependence of the spin-mixing conductance at the Pt/YIG interface [6]. These results will be helpful for obtaining full understanding of the mechanism of the LSSE and SMR.

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