



IEEE Magnetics Society Distinguished Lecturer

Spins in Low-dimensional Materials Systems: Transport, Gatecontrol and Conversion

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Abstract

Transport, control and conversion of spins in condensed matters have been pivotal concepts in spintronics. Spin transport is the most fundamental concept to realize spin-dependent phenomena, spin control mainly by gating enables information switching using a spin degree of freedom, and spin conversion allows detection of spins, a dissipative physical quantity. Whilst bulk metallic and semiconducting systems have been to date major material stages to realize the aforementioned concepts, low-dimensional materials systems such as atomically-flat two-dimensional materials [1-3], two-dimensional electron gases formed at an interface of a heterostructure [4,5], topologically-protected Dirac surface states in topological insulators [6,7] and ultrathin films [8] are becoming attractive materials stages to pursue novel spintronic concepts and phenomena. I will introduce the attractiveness of these new materials systems, cover an overview of the central achievements, and focus on recent investigation to pioneer novel spintronic physics in the low-dimensional materials systems.

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- [4]R. Ohshima, M. Shiraishi et al., “Strong evidence for d-electron spin transport at room temperature at a LaAlO₃/SrTiO₃ interface”, *Nature Mater.* 16, 609 (2017).
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- [7]Yuichiro Ando, M. Shiraishi et al., “Electrical detection of the spin polarization due to charge flow in the surface state of the topological insulator Bi_{1.5}Sb_{0.5}Te_{1.7}Se_{1.3}”, *Nano Lett.* 14, 6226 (2014).
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About the speaker

Masashi Shiraishi received the B.S., M.S., and Ph.D. degrees from Kyoto University, Japan, in 1991, 1993 and 2003. He was a researcher in SONY Corporation Research Center (1993-2004), an associate professor (2004-2010) and a professor (2010-2013) at Graduate School of Engineering Science, Osaka University, Japan. Since 2013, he has been a professor at Department of Electronic Science and Engineering, Kyoto University, Japan. He was a guest scientist of Max-Planck-Institut für Festkörperforschung (Stuttgart, 1997-1998), a guest professor of Uni. Regensburg (Germany, 2007) and a researcher of JST-PRESTO program (2007-2011).

Prof. Shiraishi has published over 150 technical articles in peer-reviewed journals, including book chapters and review articles, and has given more than 50 invited presentations at international conferences. He received Outstanding Research Award (Magnetic Society of Japan, 2013), Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (Prizes for Science and Technology, Research Category, 2017) and 36th Osaka Science Award (2018).