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报告题目：Energy Harvesting by Spin Current

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Abstract: The flow of electron spins, the so-called "spin current", is a key concept in the recent progress in spintronics [1,2]. In ferromagnetic metals and semiconductors, the spin current interacts with magnetization by the exchange interaction and induces the motion of the magnetization due to the angular momentum conservation, the so-called spin transfer torque. Its inverse effect is called the spin-motive force which is the electric voltage generated by the magnetization dynamics due to the energy conservation between electrical current and magnetization [2,3,4]. The spin motive-force is derived by introducing spin Berry phase in the Faraday's law of electro-magnetism.

Spin current is induced and manipulated by heat [5] and mechanical motion [6,7] as well. The interconversion between various energies through spin current , the so-called "power spintronics", is discussed.

[1] "Spin Current" eds. S.Maekawa, et al. (Oxford University Press, 2012 and 2017),
[2] S. Maekawa, T. Kikkawa, H. Chudo, J. Ieda and E. Saitoh: J. Appl. Phys. 133, 020902 (2023).
[3] S.E.Barnes and S.Maekawa,: Phys. Rev. Lett. 98, 246601 (2007),
[4] T. Yokouchi, et al.: Nature 586, 232 (2020).
[5] K.Uchida, S. Maekawa, et al: IEEE Proc. 104, 1946 (2016),
[6] R.Takahashi, S. Maekawa, et al.: Nature Phys. 12, 52 (2016),
[7] R.Takahashi, S. Maekawa, et al.: Nature Commun. 11, 3009 (2020).

报告人简介： Prof. Sadamichi Maekawa was born in Nara Prefecture, Japan, in 1946. He received the D.Sc. degree from Tohoku University, Sendai, Japan, in 1975. He was a Research Associate from 1971 to 1982, and an Associate Professor from 1982 to 1988 at the Institute for Materials Research, Tohoku University, Sendai, Japan, a Professor in the Faculty of Engineering, Nagoya University, Nagoya, Japan, from 1988 to 1997, a Professor at the Institute for Materials Research, Tohoku University from 1997 to 2010, and the Director of the Advanced Science Research Center, Japan Atomic Energy Agency from 2010 to 2018. Since 2018, he is a Senior Advisor in RIKEN Center for Emergent Matter Science, Japan and a visiting Chair Professor in Kavli Institute for Theoretical Sciences of UCAS, China. His main research interests include theories of electronic properties in strongly correlated electron systems, in particular, high-temperature superconductors and orbital physics in transition metal oxides, and theories of transport phenomena in magnetic nanostructures. Prof. Maekawa received Fellow of Institute of Physics (U.K.) in 1999, the Humboldt Award (Germany) in 2001, APS Fellow in 2007, the IUPAP Magnetism Award and Neel Medal in 2012, the Honoris Cause Doctorate of University of Zaragoza (Spain) in 2013, and Honda Memorial Award (Japan) in 2023.

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