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City University Distinguished Lecture Series

Speaker

Professor Hideo Ohno

President, Tohoku University



Spintronics Nanodevice

on

Friday, 15 March 2019 at 5:00 pm

at

Connie Fan Multi-media Conference Room
4/F Cheng Yick-chi Building
City University of Hong Kong
Tat Chee Avenue, Kowloon

Abstract

Development of spintronics nonvolatile nanodevices is critical in realizing standby-power free, low-power consumption, yet high performance integrated circuits for Internet-of-Things (IoT) and artificial intelligence. Magnetic tunnel junction (MTJ), a two-terminal nonvolatile spintronic device that can scale down to 20 nm with the perpendicular-easy-axis, 1) is the device most widely employed for such a purpose. In this lecture, Professor Ohno will review the development of MTJs and discuss about its ultimate scalability down to less than 10 nm. 2) He will then describe the work on three-terminal devices that separate the write current path from the read current path, focusing on spin-orbit torque switching, arising from structures involving heavy metals as well as from antiferromagnets. 3) The latter is shown to operate as analog memory suitable for neuromorphic applications. Work supported in part by the ImPACT Program of CSTI, Grant-in-Aid for Specially Promoted Research (17H06093), and OPERA.

References:

- 1) S. Ikeda, et al. *Nature Materials*, 9, 721 (2010).
- 2) K. Watanabe, et al. *Nature Communications* (2018); doi:10.1038/s41467-018-03003-7.
- 3) S. Fukami et al. *Nature Materials* 15, 535 (2016); doi:10.1038/nmat4566.

Biography

Professor Hideo Ohno received the Ph.D. degree from the University of Tokyo in 1982. He spent one year as a visiting graduate student at Cornell University in U.S.A. from 1979 and joined Hokkaido University in 1982. He was a visiting scientist at IMB T.J. Watson Research Center from 1988 to 1990. He moved to Tohoku University as professor in 1994. He has published more than 550 papers in the field of spintronics and semiconductor science and technology, which have been cited over 45,000 times. He received the IBM Japan Science Award, the IUPAP Magnetism Prize, Japan Academy Prize, Presidential Prize for Research Excellence of Tohoku University, the 2005 Agilent Technologies Europhysics Prize, the IEEE Magnetics Society Distinguished Lecturer for 2009, the Thomson Reuters Citation Laureate, the JSAP Outstanding Achievement Award, IEEE David Sarnoff Award, JSAP Compound Semiconductor Electronics Achievement Award, Leo Esaki Prize, C&C Prize and The Commendation for Science and Technology by MEXT. He is a fellow of the Institute of Physics (IOP), the Japan Society of Applied Physics (JSAP), American Physical Society (APS), Institute of Electrical and Electronics Engineers (IEEE) and an honorary professor of Institute of Semiconductors, Chinese Academy of Sciences. He was appointed to be the 22nd President of Tohoku University in 2018.

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