

6th RIEC International Workshop on

Spintronics

5-6 Feb. 2010 Sendai, Japan

Conference Room, Laboratory for Nanoelectronics and Spintronics
Research Institute of Electrical Communication, Tohoku University

<http://www.ohno.riec.tohoku.ac.jp/RIEC-spin6/>

◆ Invited Speakers

B. Dieny (CEA/ Grenoble)

T. Dietl (Polish Academy of Sciences)

M. Endo (Tohoku Univ.)

A. Fert (CNRS/ Thalès)

K. Ito (Hitachi, Ltd.)

K. M. Itoh (Keio Univ.)

T. Jungwirth (Univ. Nottingham/ ASCR)

H. Katayama-Yoshida (Osaka Univ.)

K. -J. Lee (Korea Univ.)

F. Matsukura (Tohoku Univ.)

J. Nitta (Tohoku Univ.)

T. Oda (Kanazawa Univ.)

T. Ono (Kyoto Univ.)

L. P. Rokhinson (Purdue Univ.)

Y. Suzuki (Osaka Univ.)

Y. J. Uemura (Columbia University)

D. Weiss (Univ. Regensburg)

R. Winkler (Northern Illinois Univ.)

S. Yuasa (AIST)

I. Zutic (The State Univ. of New York)

◆ Contact: Hideo Ohno

Research Institute of Electrical Communication, Tohoku University, Katahira 2-1-1, Sendai 980-8577, Japan
(e-mail: spin6th@riec.tohoku.ac.jp)

◆ Registration Fee : Free

◆ Joint Workshop

4th International Workshop on Spin Currents and 2nd International Workshop on Spin Caloritronics

8-10 Feb. 2010 Sendai, Japan

Lecture Hall, Institute for Materials Research, Tohoku University

<http://www-lab.imr.tohoku.ac.jp/~spincurrent/>

Sponsors/ Organizations

Research Institute of Electrical Communication (RIEC), Tohoku University

International Collaboration Center, Institute for Materials Research (ICC-IMR), Tohoku University

The Foundation for the Promotion of Electrical Communication Engineering (FPECE), Tohoku University

Center of Education and Research for Information Electronics Systems (GCOE-CERIES), Tohoku University

Creation and Control of Spin Current, Grant-in-Aid for Scientific Research for Priority Areas, MEXT



6th RIEC International Workshop on Spintronics

PROGRAM

February 5th (Friday)

Registration 8:30-8:50

Opening 8:50-9:00

- FR-1** 9:00-9:35 **Tomasz Dietl**
*(Institute of Physics, Polish Academy of Sciences,
Institute of Theoretical Physics, University of Warsaw)*
Ferromagnetism of Dilute and Condensed Magnetic Semiconductors
- FR-3** 9:35-10:10 **Dieter Weiss**
(Institute for Experimental and Applied Physics, University of Regensburg)
Phase Coherent Phenomena in (Ga,Mn)As
- 10:10-10:40 **Coffee Break**
- FR-4** 10:40-11:15 **Tomas Jungwirth**
(Institute of Physics Academy of Sciences of the Czech Republic and University of Nottingham)
Spin-orbit Coupling Induced Magneto-transport Anisotropy Phenomena in GaMnAs and Beyond
- FR-5** 11:15-11:40 **Fumihiko Matsukura, Yu Nishitani¹, Masaki Endo¹, Daichi Chiba^{1,2}, Maciej Sawicki^{3,1}, Anna Korbecka⁴, Jacek A. Majewski⁴, Agnieszka Werpachowska³, Tomasz Dietl^{3,4,1}, and Hideo Ohno¹**
(¹Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication, Tohoku University, ²Institute for Chemical Research, Kyoto University, ³Institute of Physics, Polish Academy of Sciences, ⁴Institute of Theoretical Physics, University of Warsaw)
Electric-field Effect on Thin (Ga,Mn)As Layers
- 11:40-14:00 **Lunch Break**

- FR-6** 14:00-14:35 **Alexandr Chernyshov¹, Mason Overby¹, Xinyu Liu², Jacek K. Furdyna², Yuli Lyanda-Geller¹, and Leonid P. Rokhinson**
(¹Department of Physics and Birck Nanotechnology Center, Purdue University, ²Department of Physics, University of Notre Dame)
Reversible Control of Magnetization via Spin-orbit Magnetic Field
- FR-7** 14:35-15:00 **Junsaku Nitta¹, Yoji Kunihashi¹, and Makoto Kohda^{1,2}**
(¹Department of Materials Science, Tohoku University, ²PRESTO-JST)
Competition between Rashba and Dresselhaus Spin-orbit Interactions in InGaAs Wires
- FR-8** 15:00-15:35 **Roland Winkler**
(Materials Science Division, Argonne National Laboratory, Northern Illinois University)
Spin Precession, Densities and Currents in Semiconductors
- FR-9** 15:35-16:00 **Yasutomo J. Uemura¹, S. R. Dunsiger^{1,2}, J. P. Carlo¹, T. Goko^{1,3}, G. Nieuwenhuys⁴, T. Prokscha⁴, A. Suter⁴, E. Morenzoni⁴, D. Chiba^{5,6}, Y. Nishitani⁶, T. Tanikawa^{5,6}, F. Matsukura^{6,5}, H. Ohno^{6,5}, J. Ohe^{7,8}, and S. Maekawa^{7,8}**
(¹Department of Physics, Columbia University, ²Physik Dept., Technische Universität München, ³TRIUMF, ⁴Paul Scherrer Institut, Lab. for Muon Spin Spect. ⁵ERATO Semiconductor Spintronics Project, Japan Science and Technology Agency (JST), ⁶Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication, Tohoku University, ⁷Institute for Materials Research, Tohoku University, ⁸CREST, JST)
Spatially Homogeneous Ferromagnetism of (Ga,Mn)As Detected by Muon Spin Relaxation

Poster Session 16:00-18:00 (Room A401)

- P-1** **Lin Chen**¹, **X. Chen**², **L. H. Chen**², and **Jianhua Zhao**¹
(¹State Key Laboratory for Superlattices and Microstructures, Institute of Semiconductors, Chinese Academy of Sciences, ²Nano-Optoelectronics Laboratory, Institute of Semiconductors, Chinese Academy of Sciences)
Manipulation of Magnetic Properties of (Ga,Mn)As Films by Nano-scale Patterning
- P-2** **Yonggang Zhu**, **Xinhui Zhang**, **Lin Chen**, and **Jianhua Zhao**
(State Key Laboratory for Superlattices and Microstructures, Institute of Semiconductors, Chinese Academy of Sciences)
Ultrafast Dynamics of Four-state Magnetization Reversal in (Ga,Mn)As
- P-3** **L. Chen**, **S. Yan**, **P. F. Xu**, **J. Lu**, **W. Z. Wang**, **J. J. Deng**, **X. Qian**, **Y. Ji**, and **Jianhua Zhao**
(State Key Laboratory for Superlattices and Microstructures, Institute of Semiconductors, Chinese Academy of Sciences)
Magnetic and Magneto-transport Properties of Heavily Mn-doped (Ga,Mn)As Films with High Ferromagnetic Transition Temperature
- P-4** **Makoto Kohda**^{1,2} and **Junsaku Nitta**¹
(¹Department of Materials Science, Tohoku University, ²PRESTO-JST)
Enhancement of Spin Orbit Interaction in Quaternary InGaAsP/InGaAs heterostructures
- P-5** **Toshihiro Kubo**¹, **Yasuhiro Tokura**^{1,2}, and **Seigo Tarucha**^{1,3}
(¹Quantum Spin Information Project, ICORP-JST, ²NTT Basic Research Laboratories, NTT Corporation, ³Department of Applied Physics, University of Tokyo)
Electron Transport through an Aharonov-Bohm-Casher Interferometer Containing a Laterally Coupled Double Quantum Dot
- P-6** **Yoji Kunihashi**¹, **Makoto Kohda**^{1,2}, and **Junsaku Nitta**¹
(¹Department of Materials Science, Tohoku University, ²PRESTO-JST)
Anisotropic Spin Splitting in InGaAs Wire Structures
- P-7** **Shunichiro Matsuzaka**, **Yuzo Ohno**, and **Hideo Ohno**
(Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication, Tohoku University)
Carrier Concentration Dependence of Spin Hall Effect in n-GaAs
- P-8** **Masaaki Ono**, **Genki Sato**, **Jun Ishihara**, **Shunichiro Matsuzaka**, **Yuzo Ohno**, and **Hideo Ohno**
(Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication, Tohoku University)
Strain Dependence of Nuclear Spin Relaxation Time in a GaAs Quantum Well
- P-9** **X. M. Dou**, **X. Y. Chang**, **Baoquan Sun**, **Y. H. Xiong**, **Z. C. Niu**, **H. Q. Ni**, and **D. S. Jiang**
(State Key Laboratory for Superlattices and Microstructures, Institute of Semiconductors, Chinese Academy of Sciences)
Electron Spin Relaxation by Nuclei and Holes in Single InAs Quantum dots

- P-10** **Soichiro Teraoka¹, Shinichi Amaha¹, Tsuyoshi Hatano¹,
Toshihiro Kubo¹, Yasuhiro Tokura², Yuzo Ohno³, Hideo Ohno³,
and Seigo Tarucha⁴**
(¹Quantum Spin Information Project, ICORP-JST, ²NTT Basic Research Laboratories,
NTT Corporation, ³Laboratory for Nanoelectronics and Spintronics, Research Institute
of Electrical Communication, Tohoku University, ⁴Department of Applied Physics,
University of Tokyo)
**Hole Spin Resonance and Spin-Orbit interaction in
p-GaAs/AlGaAs(311)A Heterostructure**
- P-11** **O. Entin-Wohlman^{1,2}, A. Aharony¹, Yoshihiro Tokura³,
and Y. Avishai¹**
(¹Department of Physics and Ilse Kats Center for Meso- and Nano-Scale Science and
Technology, Ben Gurion University, ²Weizmann Institute of Science, ³NTT Basic
Research Labs, NTT Corporation)
**Spin-polarized Electric Currents through the Constriction with
Spin-orbit Interaction**
- P-12** **Hidekazu Saito, Jean C. Le Breton, Vadym Zaytes, Y. Mineno,
Shinji Yuasa, and Koji Ando**
(Nanoelectronics Research Institute, National Institute of Advanced Industrial Science
and Technology)
Spin Injection into GaAs from a Fe/GaO_x Tunnel Injector
- P-13** **Kazuma Izumiya, Yoshio Miura, Kazutaka Abe,
and Masafumi Shirai**
(Research Institute of Electrical Communication, Tohoku University)
**A First-principles Study on Electronic Structures of Fe₃O₄/GaAs
Interface**
- P-14** **Pengfa Xu, K. K. Meng, S. L. Wang, L. Chen, J. Lu,
and Jianhua Zhao**
(State Key Laboratory for Superlattices and Microstructures, Institute of
Semiconductors, Chinese Academy of Sciences)
**Co doping Enhanced Magnetocaloric Effect in Mn_{1-x}Co_xAs Films
Epitaxied on GaAs (001) Substrate**
- P-15** **Gyung-Min Choi, Il-Jae Shin Byoung-Chul Min, and Kyung-Ho Shin**
(Center for Spintronics Research, Korea Institute of Science and Technology (KIST))
**Synthetic Antiferromagnetic Pinned Layer in Perpendicular
Magnetic Tunnel Junctions**
- P-16** **Huadong Gan¹, Shoji Ikeda¹, Jun Hayakawa²,
Hiroyuki Yamamoto^{1,2}, Katsuya Miura^{1,2}, Haruhiro Hasegawa²,
Fumihiko Matsukura¹, and Hideo Ohno¹**
(¹Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical
Communication, Tohoku University, ²Advanced Research Laboratory, Hitachi, Ltd.)
**Tunneling Spectroscopy of CoFeB/MgO/CoFeB Pseudo Spin-Valve
MTJs with Ultrahigh TMR Ratio**
- P-17** **Huadong Gan¹, Shoji Ikeda¹, Wataru Shiga¹, Jun Hayakawa²,
Katsuya Miura^{2,1}, Hiroyuki Yamamoto², Fumihiko Matsukura¹,
Tadakatsu Ohkubo³, Kazuhiro Hono³, and Hideo Ohno¹**
(¹Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical
Communication, Tohoku University, ²Advanced Research Laboratory, Hitachi, Ltd.,
³National Institute for Materials Science)
**Effect of Free Layer Structures on Tunnel Magnetoresistance for
Double MgO Barrier Magnetic Tunnel Junctions**

- P-18** Yoshio Miura, Kazutaka Abe, and Masafumi Shirai
(Research Institute of Electrical Communication, Tohoku University)
Electronic and Transport Properties of Magnetic Tunnel Junctions with Half-metallic Co₂YZ (Y = Mn or Cr; Z=Si, Al or Ga)
- P-19** Kotaro Mizunuma¹, Shoji Ikeda¹, Hiroyuki Yamamoto^{2,1}, Huadong Gan¹, Katsuya Miura^{2,1}, Jun Hayakawa², Kenchi Ito², Fumihiro Matsukura¹, and Hideo Ohno¹
(¹Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication, Tohoku University, ²Advanced Research Laboratory, Hitachi, Ltd., ³National Institute for Materials Science)
Effect of CoFeB Insertion and Pd Layer Thicknesses on TMR Properties in Perpendicular MTJs with MgO Barrier and CoFe/Pd Multilayers
- P-20** Il-jae Shin^{1,2}, Byoung-Chul Min¹, Jin-Pyo Hong², and Kyung-Ho Shin¹
(¹Center for Spintronics Research, Korea Institute of Science and Technology, ²Novel Functional Materials and Devices Lab., Department of Physics, Hanyang University)
Effect of Ru Diffusion in Exchange-biased MgO Magnetic Tunnel Junctions Prepared by *In-situ* Annealing
- P-21** Mitsuru Suzuki, Kazutaka Abe, Yoshio Miura, and Masafumi Shirai
(Research Institute of Electrical Communication, Tohoku University)
An *ab initio* Study on the Tunneling Magnetoresistance in FePt/Fe_n/MgO/Fe_n/FePt (n = 0-4) Magnetic Tunnel Junctions
- P-22** Lihui Bai¹, Makoto Kohda^{1,2}, and Junsaku Nitta¹
(¹Department of Materials Science, Tohoku University, ²PRESTO-JST)
Electrical Detection of Spin Waves in Permalloy Strips
- P-23** Masahito Tsujikawa¹, Tatsuki Oda², Yoshio Miura³, and Masafumi Shirai³
(¹Graduate School of Natural Science and Technology, Kanazawa University, ²Institute of Science and Engineering, Kanazawa University, ³Research Institute of Electrical Communication, Tohoku University)
Electric Field Effects on Magnetic Anisotropy of MgO/Pt/Fe/Pt (001)
- P-24** Shun Kanai, Masaki Endo, Shoji Ikeda, Fumihiro Matsukura, and Hideo Ohno
(Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication, Tohoku University)
Thickness Dependence of Magnetic Anisotropy in CoFeB under Electric Fields
- P-25** Toshiro Ohnuma
(Human Electromagnetics Charge Spin (HECS) Laboratory)
On Charge Spin
- P-26** Soogil Lee, Jungho Ko, and Jongill Hong
(Materials Science and Engineering, Yonsei University)
Effect of a Junction Area on Anisotropy Dispersion of the Exchange-biased Pinned Layer for MgO-based MTJs

Banquet 18:30-20:30 (Trattoria e Bar "Caccinu")

February 6th (Saturday)

- SA-1** 9:00-9:35 **Albert Fert¹, O. Boulle¹, V. Cros¹, A. Dussaux¹, B. Georges¹, J. Grollier¹, H. Jaffrés¹, A. Ruotolo¹, A. Fukushima², M. Konoto², K. Yakushiji², S. Yuasa², K. Ando², J. Barnas³, and G. Faini⁴**
(¹Unité Mixte de Physique CNRS/Thales, Palaiseau, and Université Paris-Sud, ²National Institute of Advanced Science and Technology (AIST), ³Poznan University, ⁴LPN/CNRS)
Generation of Microwave Oscillations by Spin Transfer, Synchronization of Spin Transfer Oscillators
- SA-2** 9:35-10:10 **L. E. Nistor¹, B. Rodmacq¹, C. Ducruet², C. Portemont², I. L. Prejbeanu², M. Chshiev¹, and Bernard Dieny¹**
(¹SPINTEC (UMR 8191 CEA-CNRS-UJF), CEA/INAC, ²CROCUS Technology, 4 Place Robert Schuman)
Direct Correlation between Magnetic Anisotropy and Tunnel Magnetoresistance in Magnetic Tunnel Junctions with MgO Barrier
- 10:10-10:25 **Coffee Break**
- SA-3** 10:25-10:50 **T. Koyama¹, D. Chiba¹, G. Yamada¹, K. Ueda¹, H. Tanigawa², S. Fukami², T. Suzuki², N. Ohshima², N. Ishiwata², Y. Nakatani³, and Teruo Ono¹**
(¹Institute for Chemical Research, Kyoto University, ²Device Platforms Research Laboratories, NEC Corporation, ³University of Electro-communications)
Current-induced Domain Wall Motion against Magnetic Field
- SA-4** 10:50-11:15 **Kenchi Ito¹, Jun Hayakawa¹, Katsuya Miura^{1,2}, Michihiko Yamanouchi¹, Haruhiro Hasegawa¹, Shoji Ikeda², Ryutaro Sasaki², Hiromasa Tskahashi¹, Hideyuki Matsuoka¹, and Hideo Ohno²**
(¹Advanced Research Laboratory, Hitachi, Ltd., ²Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication, Tohoku University)
Spin Transfer Torque Switching in Magnetic Tunnel Junctions with CoFeB-based Synthetic Ferri-magnetic Free Layers
- SA-5** 11:15-11:40 **Shinji Yuasa¹, Rie Matsumoto^{1,2}, Akio Fukushima¹, Taro Nagahama¹, Hitoshi Kubota¹, Kay Yakushiji¹, Koji Ando¹, and Yoshishige Suzuki^{1,2}**
(¹National Institute of Advanced Industrial Science and Technology (AIST), ²Graduate School of Engineering Science, Osaka University)
Quantitative Analysis of Coherent and Incoherent Tunneling Currents in MgO-based Epitaxial Magnetic Tunnel Junctions
- SA-6** 11:40-12:15 **Se-Chung Oh¹, Seung-Young Park², Aurélien Manchon³, Mairbek Chshiev³, Jae-Ho Han⁴, Hyun-Woo Lee⁴, Jang-Eun Lee¹, Kyung-Tae Nam¹, Younghun Jo², Yo-Chan Kong⁵, Bernard Dieny³ and Kyung-Jin Lee⁵**
(¹Semiconductor R&D Center, Samsung Electron. Co, ²Nano Mater. Research Team, Korea Basic Sci. Inst., ³SPINTEC, UMR 8191 CEA/CNRS/UJF, CEA/Grenoble, ⁴Dept. of Phys., POSTECH, Pohang, ⁵Dept. of Mater. Sci. & Eng., Korea Univ.)
Bias-voltage Dependence of Perpendicular Spin-transfer Torque in Asymmetric MgO-based Magnetic Tunnel Junctions
- 12:15-14:00 **Lunch Break**

- SA-7** 14:00-14:25 **K. Sato, T. Fukushima, M. Toyoda H. Kizaki,
and Hiroshi Katayama- Yoshida**
(*Graduate School of Engineering Science, Osaka University*)
**First Principles Theory and Computational Materials Design for
Semiconductor Nano-Spintronics:
Design vs. Experimental Realization**
- SA-8** 14:25-14:50 **Kohei M. Itoh**
(*Dept. Applied Physics, Keio University*)
Silicon Spintronics for Quantum Information Processing
- SA-9** 14:50-15:25 **Igor Zutic, Rafal Oszwaldowski, Christian Gothgen, Jeongsu Lee,
and William Falls**
(*Department of Physics, University at Buffalo*)
Semiconductor Spin-Lasers
- 15:25-15:45 **Coffee Break**
- SA-10** 15:45-16:10 **Y. Suzuki^{1,2}, Y. Shiota¹, T. Nozaki^{1,3}, M. Shiraishi¹ and T. Shinjo¹**
(*¹Osaka University, ²CREST-JST, ³PREST-JST*)
**Voltage Control of Magnetic Anisotropy in Au/FeCo(001) Ultrathin
Layer/MgO Junctions**
- SA-11** 16:10-16:35 **Masaki Endo, Shun Kanai, Shoji Ikeda, Fumihiro Matsukura,
and Hideo Ohno**
(*Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical
Communication, Tohoku University*)
**Change of Magnetic Properties in Co₄₀Fe₄₀B₂₀ Induced by Electric
Field**
- SA-12** 16:35-17:00 **Tatsuki Oda**
(*Institute of Science and Engineering, Kanazawa University*)
**Magnetic Anisotropy and Its Electric Field Effect in the
Nano-structures of Fe-Pt System**
- Closing** 17:00-17:10