Advanced Next Generation Energy Leadership (ANGEL Project, R2601)

The 2nd ANGEL Symposium, 2015

The 100th Anniversary Hall

Faculty of Engineering, Yamagata University

November 4-5, 2015

Organized by
Organizing Committee of ANGEL kick-off symposium

Supported by
Japan Society for the Promotion of Science (JSPS)
in the framework of "Program for Advancing Strategic International Networks to Accelerate the Circulation of Talented Researchers (FY 2014-2016)"

Conducted by
Yamagata University (Japan), Johannes Kepler University Linz (Austria),
The University of Vermont (USA)

Japan Society for the Promotion of Science (JSPS)
Program for Advancing Strategic International Networks to Accelerate the Circulation of Talented Researchers, FY2014-2016
"Advanced Next Generation Energy Leadership (ANGEL)" (R2601)
Yamagata University, Johannes Kepler University Linz, The University of Vermont

The 2nd ANGEL Symposium, 2015

Yamagata University, Faculty of Engineering, The 100th Anniversary Hall
Yonezawa, Yamagata, Japan

4-5 (Wed.-Thu.) November, 2015

Preface

Welcome to Yonezawa! We are pleased to organize the 2nd ANGEL symposium, 2015. The ANGEL project (Advanced Next Generation Energy Leadership) started in October 2014 for exchanging young talented researchers between the two leading research institutions, the research center for organic electronics (ROEL) of Yamagata University (YU) and Linz institute for organic solar cells (LIOS) of Johannes Kepler University Linz (JKU), as supported by the Japan Society for the Promotion of Science (JSPS). From this autumn in 2015, researchers of the physics department of the University of Vermont (UVM) have newly joined this project, so that the ANGEL project has become an intercontinental triangle research network among Japan, Europe and the USA.

The ANGEL project aims promoting scientific research for the third generation organic solar cell that surpasses standards of the former generations of organic solar cells, such as dye-sensitized and bulk-heterojunction organic thin film devices, eventually targeting over 20% efficiency. To prove the new concept to extract high voltage charge carriers from crystalline thin films of organic charge transfer complexes (charge transfer crystal =CTC) is the challenge of the study. Intensive collaboration over the last one year resulted in some new interesting discoveries. The 2nd symposium is programmed to give sufficient time for talks and discussions for the selected members from YU, JKU and UVM. The symposium is open to the public and external experts in the related field are highly encouraged to join the symposium and participate in the discussion on the new outcomes from the ANGEL project and to clear the future direction of the research on CTC solar cells.

The kick-off symposium was held in cold snowy Yonezawa in January 2015. This time, Yonezawa in early November is expected to enjoy its beautiful autumn weather. Delicious autumn harvests and beautiful autumn leaves are the touristic attraction of the season. I wish all of you, the members of the ANGEL project, interested researchers and students, have a good time during the intensive 1.5 days symposium and promote your scientific exchange. I also wish you to enjoy your stay in Yonezawa!

Tsukasa Yoshida
The chair of the 2nd ANGEL symposium, 2015
Professor, the leader of organic solar cell division
Research Center for Organic Electronics
Yamagata University

Organizing Committee (Yamagata University)

Chairperson:

Tsukasa Yoshida (yoshidat@yz.yamagata-u.ac.jp)

The leader of organic solar cell division of the Research Center for Organic Electronics (ROEL), Yamagata University, Japan

Members of Yamagata University:

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ANGEL project web site:

http://angel.yz.yamagata-u.ac.jp/

PROGRAM

4th November

12:00-13:00 Registration

13:00-13:10 *Welcome talk – Current status of the ANGEL project*
Tsukasa Yoshida, Coordinator and principal investigator of the ANGEL project, Yamagata University

Chairperson; Tsukasa Yoshida

13:10-13:40 **T1**
Organic and Hybrid Materials for Photovoltaic Conversion and Chemical Energy Storage
Niyazi Serdar Sariciftci, Johannes Kepler University Linz

13:40-14:10 **T2**
TBA
Madalina Furis, The University of Vermont

14:10-14:40 **T3**
Single absorber organic photovoltaic devices using intramolecular charge transfer photoabsorption process
Ken-ichi Nakayama[1], T. Okura[1], C. Katagiri[1], M. Mamada[1], J. Matsui[1], A. Masuhara[1], M. C. Scharber[2], M. S. White[3], C. Yumusak[2], P. Stadler[2], N. S. Sariciftci[2], T. Yoshida[1], [1]Yamagata University, [2]LIOS, Johannes Kepler University Linz, [3]The University of Vermont

14:40-14:50 Group Photograph

14:50-15:10 Coffee break

Chairperson; Cigdem Yumusak

15:10-15:40 ***Invited Talk 1***
High-Efficiency Polymer Solar Cells with Small Photon Energy Loss
Itaru Osaka, RIKEN, Center for Emergent Matter Science (CEMS)

15:40-16:10 ***Invited Talk 2***
Effect of co-evaporant on vacuum deposition of organic photovoltaic cells
Toshihiko Kaji, Department of Applied Physics, Tokyo University of Agriculture and Technology

16:10-16:40 ***Invited Talk 3***

Charge Generations and Recombination Dynamics in Polymer/Fullerene Solar Cells

Shunsuke Yamamoto, IMRAM, Tohoku University

16:40-18:00 **Poster session**

18:00-19:30 Get together party in Café Azuma

(The Best Poster Award is to be announced.)

5th November

Chairperson; Matthew White

9:00-9:30 **T4**

Solution-processed Perovskite Solar Cells

Markus Scharber, Johannes Kepler University Linz

9:30-10:00 ***Invited Talk 4***

Phenanthrodithiophene-Based Semiconducting Polymers: Effect of Side Chains on Their Solar Cell Performances

Yasushi Nishihara, Okayama University

10:00-10:20 **T5**

Controlled synthesis of block copolymers and their application to organic photovoltaics

Tomoya Higashihara, Yamagata University

10:20-10:40 Coffee Break

Chairperson; Philipp Stadler

10:40-11:10 **T6**

Photoconductivity of Single Cyrstals of Charge Transfer molecules

Jun Matsui[1], K. Nakayama[1], A. Masuhara[1], M. Mamada[1], M. C. Scharber[2], P. Stadler[2], C. Yumusak[2], E. D. Glowacki[2], M. S. White[3] N. S. Sariciftci[2], T. Yoshida[1], [1]Yamagata University, [2]LIOS, Johannes Kepler University Linz, [3]The University of Vermont

11:10-11:40 ***Invited Talk 5***

Device-less Evaluation of Organic/Perovskite Photovoltaics Towards Improving their Efficiencies

Akinori Saeki, Graduate School of Engineering, Osaka University

11:40-12:00 **T7**

Toward the Synthesis of Charge-Transfer Complexes Composed of Organic Ionic Compounds for Photovoltaics

Shuji Okada and Shun Aoyama, Yamagata University

12:00-13:00 **Strategic discussion by ANGEL members and the guests over lunch**

Chairperson; Niyazi Serdar Sariciftci

13:00-14:00 ***Keynote Lecture***

Flexible and Printed Organic Transistors and their Applications

Shizuo Tokito, Yamagata University

14:00-14:30 **T8**

TBA

Madalina Furis, The University of Vermont

14:30-14:50 Coffee break

Chairperson; Markus Scharber

14:50-15:20 **T9**

TBA

Matthew White, The University of Vermont

15:20-15:50 **T10**

Hydrogen-Bonded Semiconductor Pigments and Their Applications in Organic Electronic Devices

Cigdem Yumusak, Johannes Kepler University Linz

15:50-16:10 **T11**

Light-absorbers based on inorganic materials for solar cells

Yuta Matsushima, **Tomoki Sato, Jun Kumagai and Tsukasa Yoshida**, Yamagata University

16:10-16:30 Coffee Break

Chairperson; Jun Matsui

16:10-16:40 **T12**

DAMS-CuI as potential absorber for 3rd generation hybrid solar cells

Philipp Stadler[1], Elisa Tordin[1], Elena Cariati[1], Markus C. Scharber[1], Tsukasa Yoshida[2], N. S. Sarificti[1] [1]Johannes Kepler University Linz, [2]Yamagata UniversityMa

16:40-17:10 **T13**

Simple strategy for fabrication of organic nanocrystals and their thin film as a single active layer on organic solar cell

Akito Masuhara[1, 3], Jun Matsui[1, 3], Patrick Denk[4], Toshimitsu Sato[1], Keiji Shito[1], Ken-nichi Nakayama[1, 3], Philipp Stadler[4], Markus Scharber[4], Matthew White[5], Niyazi Serdar Sariciftci[4], Tsukasa Yoshida[1, 3], and Shuji Okada[1], [1]Graduate school of science and engineering, Yamagata Univ., [2]Faculty of engineering, Yamagata Univ. [3]Reserch center for organic electronics, Yamagata Univ. [4]Linz Institute for Organic Solar Cells (LIOS),, Johannes Kepler Universität Linz, [5]The University of Vermont

17:10-18:00 **Free discussion by the participants** (Moderator; N.S. Sariciftci and T. Yoshida)

POSTER SESSION

P1 *Novel CT crystal consisting of 1,3-bis(dicyanomethylidene)indan (TCNI) and methylviologen (MV)*
Taichi Yasuhara , Jun Matsui and Tsukasa Yoshida, Yamagata University

P2 *Synthesis and Solar Cell Application of Structure Controlled ZnO Nanocrystals*
He Sun[1], Takashi Sugiura[2] Matthew White[3] and Tsukasa Yoshida[1], (Yamagata Univ.[1] Gifu Univ.[2] University of Vermont[3])

P3 *Thiophene-spacer effect on low-bandgap naphthalene diimide based semiconducting polymers*
Seijiro Fukuta, Hung-Chin Wu, Tomoyuki Koganezawa, Yukou Isshiki, Mitsuru Ueda, Wen-Chang Chen and Tomoya Higashihara*, Yamagata University

P4 *Synthesis of all conjugated block copolythiophenes bearing trisiloxane group*
Satoshi Miyane and Tomoya Higashihara, Yamagata University

P5 *Controlled Synthesis of Poly(p-phenylene) using Zincate Complex, tBu_4ZnLi_2*
Yuto Ochiai and Tomoya Higashihara, Yamagata University

P6 *Development of new side chain skeletons of the π-conjugated polymer*
Go Yamashita and Tomoya Higashihara, Yamagata University

P7 *Nanocrystallization of charge transfer (CT) materials with fullerene*
Atsushi Ito and Akito Masuhara, Yamagata University

P8 *Synthesis of high dispersed $Au@SiO_2$ nanoparticles in organic solvents and investigation of formation behavior of SiO_2 shell*
Kana Miyakawa, Hiroki Watanabe, Hiroyuki Naiki, and Akito Masuhara, Yamagata University

P9 *Improving the stability of C_{60} nanocrystals dispersion for fabricating density packed nanocrystals thin films*
Saki Morizane and Akito Masuhara, Yamagata University

P10 *Orientation of semiconducting polymer films through nanoparticle precursor*
Toshimitsu Sato[1], Tasuku Mizuno[2], Syusaku Nagano[3], Takahiro Seki[2], and Akito Masuhara[1,4], [1]Graduate school of Science and engineering, Yamagata Univ., [2]Graduate school of engineering, Nagoya Univ., [3]Nagoya Univ. VBL, [4]Research Center for Organic Electronics, Yamagata University,

P11 *Fabrication and characterization of OPV active layers incorporating Ferroelectric polymer nanocrystals*

Masaki Takeda, Saki Morizane and Akito Masuhara, Yamagata University

P12 *Fabrication Protocol for $CH_3NH_3PbI_3$ Perovskite Crystals via Lead Halide Solvent Complex Nanocrystals*

Kazuki Umemoto, Yasufumi Hayasaka, Hiroyuki Naiki and Akito Masuhara, Yamagata University

P13 *Photovoltaic activity of photosensitive silver compounds*

Jun Kumagai, Tsukasa Yoshida and Yuta Matsushima, Yamagata University

P14 *Preparation of ZnO/copper oxide hetero-junction type solar cells*

Tomoki Sato, Tsukasa Yoshida and Yuta Matsushima, Yamagata University

P15 *Densely packed lamellar thin film produced by annealing under humidified conditions*

Yuki Hashimoto[1], Takuma Sato[1], Shusaku Nagano[2], Yuki Nagao[3], Shunsuke Yamamoto[4], Masaya Mitsuishi[4], and Jun Matsui[1], [1]Graduate School of Science and Engineering, Yamagata University, [2]Venture Business Laboratory, Nagoya University, [3]School of Materials Science, Japan Advanced Institute of Science and Technology, [4]Institute of Multidisciplinary Research for Advanced Materials, Tohoku University

P16 *Multicolor electrochromism in a single electrode LbL polymer film*

Kenta Hojo,[1] Kenta Ono,[1] Manabu Ishizaki,[1] Katsuhiko Kanaizuka,[1] Shin-ichi Kondo,[1] Masato Kurihara,[1] Masaya Mitsuishi,[2] and Jun Matsui,[1] [1]Graduate School of Science and Engineering, Yamagata University, [2]Institute of Multidisciplinary Research for Advanced Materials, Tohoku University

P17 *Effect of Proton-conducting Group Content on Conductivity in Two-dimensional Interfaces Using the Langmuir-Blodgett Technique*

[1]Takuma Sato, [2]Masaya Mitsuishi, [2]Tokuji Miyashita, [3]Shusaku Nagano, [4]Makoto Gemmei-Ide, and [1]Jun Matsui, [1]Graduate School of Science and Engineering, Yamagata University, [2]Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, [3]Venture Business Laboratory, Nagoya University, [4]Graduate School of Science and Engineering, Toyama University

P18 *Optical Properties of Stilbazolium-Based Acceptors and Their mixture with Donors*

Shun Aoyama and Shuji Okada, Yamagata University

P19 *Nanocrystal Fabrication of (Dimethylamino)stilbazolium Derivatives and the Orientation Fixation*

Toshiaki Wada and Shuji Okada, Yamagata University

P20 *Vertical-type metal-base organic transistors using hydrogen-bonded materials as an emitter*
Y. Hayashi, C. Yumusak, E. D. Glowacki, N. S. Sariciftci, T. Yoshida, and K. Nakayama, [1]Yamagata University, [2]LIOS, Johannes Kepler University Linz

P21 *Single-layered organic solar cells using intramolecular charge transfer molecules*
T. Okura[1], C. Katagiri[1], J. Matsui[1], M. C. Scharber[2], M. S. White[3], C. Yumusak[2], P. Stadler[2], N. S. Sariciftci[2], T. Yoshida[1], K. Nakayama[1], [1]Yamagata University, [2]LIOS, Johannes Kepler University Linz, [3]The University of Vermont

P22 *IMVS and IMPS measurements in organic thin-film solar cells*
Kazuhiro Tanaka, Tatsuya Okura, Chiho Katagiri, Tsukasa Yoshida, Ken-ichi Nakayama, Yamagata University

P23 *Electrodeposition of ZnO / Rhodamine B hybrid thin films with nano-Turing patterns*
Shu Uno[1], Lina Sun[1] ,Yuta Ogawa[1] ,Matthew White[2], and Tsukasa Yoshida[1] (Yamagata Univ.[1], Univ. Vermont[2])

Oral Presentations

30 min. Talks = 20-25 min. Presentation + 5-10 min. Discussion

20 min. Talks = 15 min. Presentation + 5 min. Discussion