

SCIENTIFIC PROGRAM

The Second Conference on Artificial Muscles - Biomimetic System Engineering

May. 20 (Thu)

9 : 30 - 9 : 40 *Opening Remarks,*

Takahisa Taguchi (National Institute of Advanced Industrial Science and Technology)

Chairperson: **Keisuke Oguro** (National Institute of Advanced Industrial Science and Technology)

9 : 40 - 10 : 25 *Invited Speech,*

Biomimetic Robots using EAP as Artificial Muscles – Progress and Challenges

Yoseph Bar-Cohen (Jet Propulsion Laboratory, USA)

Chairperson: **Zhi-Wei Luo** (BMC RIKEN)

10 : 25 - 11 : 10 *Invited Speech,*

Haptic Virtual Reality

Tsuneo Yoshikawa (Kyoto University)

Invited Lectures

Chairperson: **Kinji Asaka** (National Institute of Advanced Industrial Science and Technology)

11 : 10 - 12 : 10 *Session I,*

Conducting Polymer Actuators Working in Air

Hidenori Okuzaki (Interdisciplinary Graduate School of Medicine and Engineering, University of Yamanashi)

Electroactive paper actuator coated with Conducting Polypyrrole

Jaehwan Kim, S. D. Deshpande, Sung-Ryul Yun, Lie-Jie Zhao (Department of Mechanical Engineering, Inha University)

Artificial Muscles Based on Polypyrrole Actuators with Large Strain and Stress Generated Electrochemically

Susumu Hara¹, Tetsuji Zama^{1,2}, Wataru Takashima², Keiichi Kaneto²

(¹EAMEX Co., ²Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology)

12 : 10 - 13 : 00 **Lunch**

Chairperson: **Kinji Asaka** (National Institute of Advanced Industrial Science and Technology)

13 : 00 - 13 : 45 *Invited Speech,*

Super Tough Nanotube Composite Fibers for Artificial Muscle Applications

Ray. H. Baughman (University of Texas at Dallas)

Chairperson: **Yoshihiro Nakabo** (BMC RIKEN)

13 : 45 - 14 : 30 *Invited Speech,*

Creeping of plasticized poly(vinyl chloride) gel

Toshihiro Hirai (Shinshu University)

Chairperson: **Yoshihiro Nakabo** (BMC RIKEN)

14 : 30 - 15 : 30 *Session II,*

Liquid Crystal Elastomers Swollen with Nematic Liquid Crystals As an Electrically Driven Artificial Muscle

Yusril Yusuf¹, P. E. Cladis², Helmut R. Brand³, Heino Finkelmann⁴, Shoichi Kai⁵ (¹Graduate School of Engineering, Kyushu University, ²Faculty of Engineering, Kyushu University, Advanced Liquid Crystal Technologies, ³Faculty of Engineering, Kyushu University, Theoretische Physik III, Universität Bayreuth, ⁴Makromolekulare Chemie, Universität Freiburg, ⁵Graduate School of Engineering, Kyushu University, Department of Applied Physics, Faculty of Engineering, Kyushu University, Department of Life Engineering, Graduate School of Systems Life Sciences, Kyushu University)

Ionic Conduction and Electrostatic Cluster Response in Ionomeric Polymer Transducers

Donald Leo¹, Barbar Akle¹, Lisa Weiland¹, Matthew Bennett¹, Mike Hickner², James McGrath² (¹CIMSS/Mechanical Engineering Department Virginia Tech, ²Chemistry Department Virginia Tech)

Self-oscillating gels and their application to biomimetic micro/nano-actuating systems

Ryo Yoshida, Yusuke Hara, Takamasa Sakai, Masahiro Tanaka (Graduate School of Engineering, The University of Tokyo)

15 : 30 - 16 : 30 **Poster Session • Demonstration • Coffee Break**

Chairperson: **Yoshihiro Nakabo** (BMC RIKEN)

16 : 30 - 17 : 15 *Invited Speech,*

Calcium ion regulation of muscle contraction

Iwao Ohtsuki (Department of Physiology, Jikei University School of Medicine)

Chairperson: **Keiichi Kaneto** (Kyushu Institute of Technology)

17 : 15 - 18 : 00 *Invited Speech,*

Natural Resolution of Ill-posedness of Inverse Kinematics for Redundant Multi-joint Movements

Suguru Arimoto (Graduate School of Science and Engineering, Ritsumeikan University)

18 : 30 - 20 : 00 **Welcome Party**

May. 21 (Fri)

Chairperson: **Takahisa Taguchi** (National Institute of Advanced Industrial Science and Technology)

9 : 30 - 10 : 00 *Invited Speech,*

Modelling on electromechanical response of polymer electrolyte actuators (Tentative)

Kinji Asaka (National Institute of Advanced Industrial Science and Technology)

Chairperson: **Takahisa Taguchi** (National Institute of Advanced Industrial Science and Technology)

10 : 00 - 11 : 00 *Keynote Speech,*

Intelligent Gels-An Approach to Artificial Muscles

Yoshihito Osada (Hokkaido University)

11 : 00 - 11 : 10 **Coffee Break**

Chairperson: **Toshiharu Mukai** (BMC RIKEN)

11 : 10 - 12 : 30 *Session III,*

Wave-shape pattern generation of electroactive polymer gel in controlled electric fields

Mihoko Otake, Yoshihiko Nakamura, Hirochika Inoue (University of Tokyo)

Underwater Micro Biped Robot with Multi DOF

Yuya Okuda¹, Shuxiang Guo¹, Kinji Asaka² (¹Kagawa Univ., ²National Inst. of AIST)

Control of Biped Walking Robots with IPMC Linear Actuator with Re-doping

Capability

Masaki Yamakita^{1,2}, **Norihiro Kamamichi**¹, **Takahiro Kozuki**¹, **Kinji Asaka**^{2,3}, **Zhi-Wei Luo**² (¹Tokyo Institute of Technology, ²RIKEN, ³AIST)

A multi-DOF robot manipulator with a patterned artificial muscle

Yoshihiro Nakabo¹, **Toshiharu Mukai**¹, **Kinji Asaka**^{1,2} (¹BMC RIKEN, ²AIST)

12 : 30 - 13 : 30 **Lunch**

Chairperson: **Masaki Yamakita** (Tokyo Institute of Technology)

13 : 30 - 14 : 15 *Invited Speech,*

Bio-mimetic control ----- The present status and the subjects

Shigeyuki Hosoe (RIKEN, Nagoya University)

Chairperson: **Masaki Yamakita** (Tokyo Institute of Technology)

14 : 15 - 15 : 15 *Session IV,*

Actuator Using Electrostriction Effect of Fullerenol-Doped Polyurethane Elastomer (PUE) Films

Jun Kyokane¹, **Naoki Tsujimoto**¹, **Yuki Yanagisawa**¹, **Tsutomu Ueda**², **Masumi Fukuma**³ (¹Nara National College of Technology, ²Nitta Corporation, ³Matsue National College of Technology)

Application of a Solid Polymer Electrolyte Membrane-Gold to an Active Graft

Tadashi Ihara¹, **Taro Nakamura**¹, **Yoshito Ikada**¹, **Kinji Asaka**², **Keisuke Oguro**², **Naoko Fujiwara**² (¹Suzuka University of Medical Science, ²National Inst. of AIST)

Electroactive Polymer Artificial Muscle (EPAM) for Biomimetic Robots

Scott Stanford, **Ron Pelrine**, **Roy Kornbluh**, **Qibing Pei**, **Seiki Chiba** (SRI International)

15 : 15 - 16 : 15 **Poster Session • Demonstration • Coffee Break**

Chairperson: **Zhi-Wei Luo** (BMC RIKEN)

16 : 15 - 17 : 00 *Invited Speech,*

Muscle-like mechanical impedance aids interactive robotics

Neville Hogan (MIT)

Chairperson: **Toshihiro Hirai** (Shinshu University)

17 : 00 - 17 : 45 *Invited Speech,*

*Enhancement of electrochemomechanical deformations in conducting polymers,
polyaniline films*

Keiichi Kaneto (Kyushu Institute of Technology)

17 : 45 - 18 : 00 *Closing Remarks,*

Yoseph Bar-Cohen (Jet Propulsion Laboratory, USA)

Poster Session

1. *Chaotropic effect of supporting electrolytes on Electroactive Polymers (EAP) and their applications for Artificial Muscles Biomimetic Systems (AMBS)*

Afshad Talaie¹, **Takahisa Taguchi**² (¹Frontier Research Center, Department of Applied Chemistry, Faculty of Engineering, Osaka University, ²Human life Technology, National Institute of Advanced Industrial Science and Technology)

2. *The theory and simulation of the bending dynamics of polyelectrolyte membrane by electric stimuli*

Tatsuya Yamaue^{1,2}, **Hiroto Mukai**¹, **Masao Doi**¹ (¹Department of Computational Science and Engineering, Nagoya University, ²Biorheo project, CREST, Japan Science and Technology Agency)

3. *A linear actuator using composites based ionic polymer and minute carbon particles*

Masayoshi Ishibashi, **Midori Kato** (Hitachi Ltd., Advanced Research Lab.)

4. *Spinning of Conducting Microfibers for Artificial Muscular Filaments*

Takumi Takahashi, **Masayoshi Ishihara**, **Hidenori Okuzaki** (Interdisciplinary Graduate School of Medicine and Engineering, Univ. of Yamanashi)

5. *Development of a Soft-actuator with Viscoelasticity for Estimating Human Muscle Dynamics*

Kunihiko Ito^{1,2}, **Katsumi Mita**^{1,2}, **Zhi-Wei Luo**², **Kumi Akataki**¹, **Makoto Watanabe**¹ (¹Aichi Human Service Center, ²BMC RIKEN)

6. *Control of Mechanical Impedance of IPMC Linear Actuator with Antagonism Structure*
Masaki Yamakita^{1,2}, Yasuaki Kaneda¹, Norihiro Kamamichi¹, Kinji Asaka³, Zhi-Wei Luo²
^(¹Tokyo Institute of Technology, ²RIKEN, ³AIST)

7. *A snake-like swimming artificial muscle*
Koji Ogawa¹, Yoshihiro Nakabo², Toshiharu Mukai², Kinji Asaka^{2,3}, Noboru Ohnishi¹
^(¹Graduate School of Information Science, Nagoya University, ²Bio-mimetic Control Research Center, RIKEN, ³National Institute of AIST)

8. *Adjustment of Impedance Center for Passive Interaction between A Robot and Its Environment*
Zhi-Wei Luo¹, Yasuo Kishi², Fumihiko Asano¹, Shigeyuki Hosoe^{1,3} ^(¹RIKEN, ²Yasukawa Corp., ³Nagoya Univ.)

9. *Development of A Dynamic Human Movement Analysis Platform*
Kenji Tahara¹, Tadashi Odashima¹, Masaki Onishi¹, Fumihiko Asano¹, Zhi-Wei Luo¹, Shigeyuki Hosoe^{1,2} ^(¹RIKEN, ²Nagoya Univ.)

10. *Fibrous Artificial Muscles Comprising Polypyrrole-Metal Coil Composites*
Tetsuji Zama^{1,2}, Susumu Hara¹, Wataru Takashima², Keiichi Kaneto² ^(¹EAMEX Co., ²Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology)

11. *Flow Control around an Airfoil by an Artificial Muscle*
Masaki Fuchiwaki¹, Kazuhiro Tanaka¹, Kazuo Onishi², Shingo Sewa² ^(¹Kyushu Institute of Technology, ²EAMEX Co.)

Demonstration

1. *Electroactive Polymer Artificial Muscle (EPAM) Actuators*
Scott Standford, Ron Pelrine, Roy Kornbluh, Qibing Pei, Seiki Chiba (SRI International)

2. *Polymer Actuator Devices*
Kazuo Onishi (EAMEX Co.)

3. *An Application of Artificial Muscles on Robotics*
Yoshihiro Nakabo¹, Toshiharu Mukai¹, Zhi-Wei Luo¹, Kinji Asaka^{1,2} ^(¹BMC RIKEN, ²AIST)