

The history of IFMFC – The accumulated knowledge and experience of the magnetic force control with IFMFC

Tsuneo Watanabe

Tokyo Metropolitan University, Tokyo, Japan

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Abstract

The history of IFMFC (International Forum on Magnetic Force Control) shows the usefulness of the magnetic force control in the fields of the environment and material resource in Japan, Korea and China. The IFMFC started in 2010 and has been organized in every year. This paper shows the application of the magnetic force control in each countries with the accumulated knowledge and experience of the magnetic force control with IFMFC.

Keywords : Magnetic separation, Environment remediation and material resource

1. THE BACKGROUND OF IFMFC

The magnetic force control has many advantages due to the physical treatment process:

- 1) A little secondary product
- 2) The fast treatment
- 3) The stable treatment
- 4) The simple system construction
- 5) The small space treatment
- 6) Many application fields.

The development of the convenient superconducting magnet promoted the application of the magnetic force control(MFC) especially in the fields of environment remediation and material recycling with the magnetic separation(MS) technology. The active promotion of the four MS projects started from 1995 in Japan. In the middle of 2000 years the similar MS projects also started in Korea and China.

IFMFC(International Forum of Magnetic Force Control) started on 2010 at Tokyo. This forum was organized with the leading researchers of China, Japan and Korea to exchange knowledge and experience as to the magnetic force control. The start of this forum at Tokyo Olympics memory young people center had the following necessary background:

- 1) The wide space of the strong magnetic field could be used with development of the convenient superconducting magnet.
- 2) The magnetic force control technology, especially magnetic separation technology, has the innovative potential in environment and material circulation in each countries.
- 3) The first IFMFC was organized successively the magnetic separation summer school for Japanese students and foreign researchers.



Fig. 1. The first IFMFC at Tokyo Olympics memory young people center in 2010.



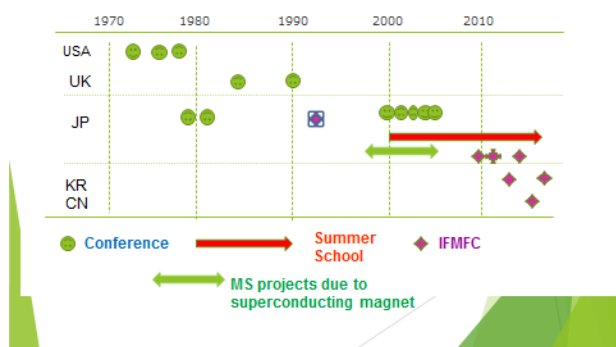
Fig.2. The attendance of 2010 IFMFC.

* Corresponding author: twtm@tmu.ac.jp



Fig. 3. The MS summer school at Tokyo in 2010.

Table 1 The History of IFMFC and International Conference of Magnetic Separation



The IFMFC has been promoting the international contribution to the accumulated knowledge and experience of the magnetic force control from 2010 (Table 1).

2. THE ACTIVITIES OF IFMFC

The activities of IFMFC are these;

a) Annual forum including the satellite conference at the International conference

We could have the annual forum as these; 2010 in Tokyo, 2011 in Osaka, 2012 in Busan, 2013 in Osaka, 2014 in Beijing and 2015 in Seoul as the satellite of MT24.

b) Training the young researchers

The members of Japanese steering committee has been managed the annual summer school for training the young researchers from 2002. The 2010 and 2011 forum had the joint with this summer school.

c) Technical tours

At 2010 forum in Tokyo, the technical tour to MAS (Magnetic activated sludge) facility was planned with Prof. Yasuzo Sakai in Utsunomiya University.

At 2012 forum in Busan, the technical tour to KERI laboratory was planned by Dr. Dong-Woo Ha.

At 2013 forum in Osaka, the technical tour to Nishijima laboratory was planned by Prof. Shigehiro Nishijima in Osaka University.

At 2014 forum in Beijing, the technical tour to IPC laboratory of CAS was planned by Prof. Lai-Feng Li, to HEPI laboratory of CAS by Prof. Zhu Zian and to USTB laboratory by Prof. Li Suqin, respectively.

d) The international continuation of the magnetic force control technology especially with the superconducting magnet

The international conference of the technology with the superconducting magnet has been opened up to the middle of 2000 years. After that there was few international conference. The reasons of this decrease would be that the advantage were not recognized in other fields of energy and medical apparatuses. Especially the superconducting magnet cost suppress the propagation of the magnetic force control applications. The IFMFC contributes to spread the new application fields of the environment remediation and material resource with use of the superconducting magnet. These applications will contribute to keep the sustainable growth society.

3. REVIEW OF IFMFC PRESENTATIONS

The total presentations of IFMFC is 53 during 6 forums. The 37 presentations are reported with use of the superconducting magnet. The presentations are divided into the two fields of the MS Technology and the others.

A. The magnetic separation

The total presentations are 43. The 23 presentations are about the environment remediation. The 20 presentations are about the material recycling.

B. The other application

The total presentations are 10. Their fields are as these;

- 1) medical; MRI, DD and Detector
- 2) energy; Rectifier
- 3) material production; Protein, Magnetic nano-sphere, Magnetic Hydroxyapatite

The detail review is shown in the reference.

ACKNOWLEDGMENT

The IFMFC could stimulate the knowledge and experience of the magnetic force control in the fields of the environment remediation and material resources that will contribute the world sustainable society formation.

The author would like to express sincerely thanks to continue the IFMFC for the members and organizations. The general chairman changed from Tsuneo Watanabe to Prof. Shigehiro Nishijima in Osaka University. He is the most active researcher in the application field of the magnetic force control and has enough practical experience.

REFERENCES

The abstract issues were prepared from 2011 IFMFC. The following review shows the presenter, title, area, fields (environment remediation, material resource, other use), Magnet types (superconducting, others).

2011 OSAKA

【ORAL】

- 1) Dong-Woo Ha (KERI, KR)
<Material Recycling, Superconducting Magnet>
“Purification of Condenser Water of Thermal Power Station by Superconducting Magnet Magnetic Separation”
- 2) Hee-Won Kwon (Andong Nat. Univ. KR)
<Environment Remediation, Superconducting Magnet>
“Synthesis of Magnetized Activated Carbon and its Environmental Application”
- 3) Zhu Zian (IHEP, CN)
<Material Recycling, MRI, Superconducting Magnet>
“Development of Superconducting Magnet and its Application in IHEP”
- 4) Li Suqin (USTB, CN)
<Material Recycling, Superconducting Magnet>
“Application of Superconducting HGMS Technology on Dedusting Wastewater Treatment”
- 5) Hidehiko. Okada (AIST, JP)
<HGMS Simulation, Superconducting Magnet>
“Simulation of Particle Motion in Fluid under Magnetic Field of HGMS”
- 6) Shigehiro Nishijima (Osaka Univ. JP)
<Material Recycling, Superconducting Magnet>
“Separation of Impurity in Molten Metals by using Superconducting Magnet”

2012 PUSAN

【ORAL】

- 1) K.Seong (KERI, KR)
<Load map, Superconducting Magnet>
“Introduction of R and D on Superconducting Technology in Korea”
- 2) Young-Hum. Kim (Andong Nat. Univ. KR)
<Environment Remediation, Superconducting Magnet>
“Treatment of Dye wastewater using magnetized activated carbon and Magnetic Separation”
- 3) Zhu Zian (IHEP, CN)
<Material Recycling, Superconducting Magnet>
“Development of a 5.5T HGMS machine for purification of Kaolin clay”
- 4) Yasuzou Sakai (Utsunomiya Univ. JP)
<Environment Remediation, Permanent Magnet>
“High Rate purification of Dairy wastewater by multistage treatment with MAS process, coagulation and oxidation process”
- 5) Shigehiro Nishijima (Osaka Univ. JP)
<Environment Remediation, Material Recycling, Superconducting Magnet>
“Application of MS technology to industrial waste treatment and Removal of decontamination of radioactive contaminated soil”
- 6) Satoshi Fukui (Niigata Univ. JP)
<Magnetic force calculation, Superconducting Magnet>
“The theoretical Calculation of magnetic force for MS”
- 7) S.Ochiai (Utsunomiya Univ. JP)
<Environment Remediation, Permanent Magnet>
“Application of MAS process for the decontaminates removal of Kaolinite contaminated with radioactive substances”
- 8) Y.Chen (Utsunomiya Univ. JP)
<Environment Remediation, Permanent Magnet>
“Application of MAS process to industrial surfactant wastewater in Indonesia”
- 9) S.K.Baik (KERI, KR)
<Simulation, Superconducting Magnet>
“Magnetic Force Calculation on Iron-oxide Particle from Condenser Water of a Thermal Plant”

2013 OSAKA

【ORAL】

- 1) Zhu Zian, L. Zhao (IHEP, CN)
<Material Recycling, Superconducting Magnet>
“Installation and Test Run of a Magnetic Separation Machine for Kaolin Clay”

- 2) S.He, S.Q.Li, S.Z.Fang, Y.J.Hao, G.H.Xiong (USTB, CN)
<Material Recycling, Superconducting Magnet>
“Application of Superconducting HGMS Technology on Separating and Recycling Valuable Substances from Vanadium Slag Tailings”
- 3) M. L.Saha (Univ. of Dhaka, BN)
<Environment Remediation, Permanent Magnet>
“Application of Magnetic Separation Technique in Various Biological Processes”
- 4) N. Hirota (NIMS, JP)
<Material Production, Superconducting Magnet>
“Development of High Through-put High Quality Protein Crystal Growth Utilizing High Magnetic Field”
- 5) S.Nishijima (Osaka Univ. JP)
<Material Resource, Drag delivery, Superconducting Magnet>
“The Superconducting Magnetic force Control Tech. for Industrial Applications”
- 6) Hao Zhang, X. Xu, H. Yang, R. Huang, L. Li (CAS, CN)
<Rectifier, Superconducting Magnet>
“Design of a Multiphase Synchronous Rectifier as a Low-voltage, High Current Power Supply”
- 7) H. Yang, H. Zhang, R. Huang, C. Huang, L. Li (CAS, CN)
<Material Production, >
“Preparation of Sunflower-like Magnetic Hydroxyapatite Nanospheres and their Treatment for Pb(II), Y(III), Sb(III), Eu(III)”
- 8) Y. Akiyama, N. Nomura, F. Mishima, S. Nishijima (Osaka Univ. JP)
<Environment Remediation, Superconducting Magnet>
“The Possibility of Volume Reduction of Cesium Contaminated Soil by Magnetic Separation”
- 9) I. Ihara, Y. Sakai, K. Toyoda, K. Umetsu (Kobe Univ. Utsunomiya Univ. Obihiro Univ. of Agriculture and Veterinary Medicine, JP)
<Environment Remediation, Permanent Magnet>
“Magnetic Separation of Veterinary Antibiotics for Livestock Wastewater Treatment”
- 10) S. Fukui, T. Oka (Niigata Univ. JP)
<Material Recycling, Superconducting Magnet>
“Application of MS Using HTS Bulk Magnets to Ground Water Purification and Ni-sulfate Recycle”

【POSTER】

- 11) T. Onodera, Y. Sakai, M. Kashiwazaki (Utsunomiya Univ. JP)
<Environment Remediation, Permanent Magnet>
“Proposal of a Dairy Wastewater Treatment at Pilot Scale Utilizing the Magnetic Activated Sludge method”
- 12) W. Gao, Y. Sakai, M. L. Saha (Utsunomiya Univ. JP, Univ. of Dhaka, BN)
<Environment Remediation, Permanent Magnet>
“Treatment of Waste-milk Containing Tetracycline by Magnetic Activated Sludge method and Contact Oxidation Process”
- 13) K. Sakai, Y. Sakai, J. Nakaoka, M. L. Saha (Utsunomiya Univ. JP, Univ. of Dhaka, BN)
<Environment Remediation, Permanent Magnet>
“Evaluation of Separation Performance of Commercially Magnetic Drum Separator Including Neodymium Magnet for Magnetic Activated Sludge method”
- 14) N. Takeda, I. Ihara, K. Toyoda, K. Umetsu (Kobe Univ. Obihiro Univ. of Agriculture and Veterinary Medicine)
<Environment Remediation, Permanent Magnet>
“Electrocoagulation for Magnetic seeding of Tetracycline Antibiotic on Wastewater Treatment”
- 15) Y. Kitazono, I. Ihara, K. Toyoda, K. Umetsu (Kobe Univ. Utsunomiya Univ. Obihiro Univ. of Agriculture and Veterinary Medicine, JP)
<Environment Remediation, Permanent Magnet>
“Electrochemical Degradation of Veterinary Antibiotics as a Post-treatment of Magnetic Separation Effluent”
- 16) N. Nomura, K. Sekiya, F. Mishima, Y. Akiyama, S. Nishijima (Osaka Univ. JP)
<Environment Remediation, Superconducting Magnet>
“Study on Decontamination of Contaminated Soil by Magnetic Separation”
- 17) K. Wada, F. Mishima, Y. Akiyama, S. Nishijima (Osaka Univ. JP)
<Material Recycling, Superconducting Magnet>
“The Development of the Separation Apparatus of Phosphorus by Controlling the Magnetic Force”

- 18) K.Hashiguchi,F.Mishima, Y.Akiyama,S.Nishijima (Osaka Univ. JP)
 <Material Recycling, Superconducting Magnet>
 “Magnetic Separation System for Recovery of Glass Polishing Agent”
 19) Y.Ueda,F.Mishima,Y.Akiyama,S.Nishijima (Osaka Univ.JP)
 <Material Recycling, Superconducting Magnet>
 “Study of Plastic Separation Utilizing Magnetic Separation”

2014 BEIJING

【ORAL】

- 1) T. Watanabe (TMU, JP)
 <Review of IFMFC, Superconducting Magnet>
 “The Features of Magnetic Force Control and the IFMFC History”
 2) S.Nishijima (Osaka Univ. JP)
 <Environmental Remediation, Superconducting Magnet>
 “Application of Superconducting Magnetic Separation for Decontamination Soil in Fukushima”
 3) Suqin..Li (USTB,CN)
 <Material Recycling, Superconducting Magnet>
 “Application of Superconducting HGMS Technology in Resource Utilizing of Silicon-based iron Tailings”
 4) Y.Chen (IHEP, CN)
 <Environmental Remediation, Superconducting Magnet>
 “Technical Process and Application Prospects of Superconducting MS Technique for Dealing with Mercury-containing Wastewater”
 5) T.Oka (Niigata Univ. JP)
 <Material Recycling Superconducting Magnet>
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 6) I. Ihara (kobe Univ.JP)
 < Environmental Remediation, Permanent Magnet >
 “Magnetic Separation of Veterinary Antibiotics in Livestock Wastewater by Electrocoagulation Using Iron Anode”
 7) H.Zhang (IHEP, CN)
 <Accelerator Magnet>
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 8) Y. Sakai (Utsunomiya Univ. JP)
 <Environmental Remediation, Permanent Magnet>
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 9) H. Yang (CAS, CN)
 <Environmental Remediation, Superconducting Magnet>
 “Hydroapatite-coated Magnetic Carbon Microspheres for Superconducting Magnetic Separation”

- 10) G. Zang (IHEP, CN)
 <Material Recycling, Superconducting Magnet>
 “Progress of Superconducting Magnetic Separation for Electronic Waste and Kaolin”

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 “The accumulated knowledge and experience of MFC with IFMFC”
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