

JSPS Core-to-Core Program
FY2009 Implementation Plan (Project No. 18004)

Research Theme Advanced Particle Handling Science
 Duration of Project 2008/4/1 - 2011/3//31 (36months)
 Core Institution in Japan (Co-Chair) Graduate School of Engineering, Kyoto University
(Ko Higashitani, Specially Assigned Professor)

Implementing Organizations

○ **Japan**

Japan	Core Institution	Graduate School of Engineering, Kyoto University	
	Co-Chair (name and title)	Ko Higashitani, Specially Assigned Professor	
	Cooperating Institutions	Graduate School of Pharmaceutical Sciences, Kyoto University Institute for Frontier Medical Sciences, Kyoto University Innovative Collaboration Center, Kyoto University Doshisha University Faculty of Science and Engineering Doshisha University Graduate School of Engineering Graduate School of Natural Science and Technology, Okayama University Faculty of Engineering Pharmaceutical Sciences, Kobe Gakuin University Graduate School of Engineering, University of Hyogo	Number of Cooperating Institutions 8

○ **Partner Countries**

United States of America	Core Institution	Particle Engineering Research Center, University of Florida	
	Co-Chair (name and title)	Brij Moudgil, Head of the center, Professor	
	Cooperating Institutions	0	Number of Cooperating Institutions 0

United Kingdom	Core Institution	Institute of Particle Science and Engineering, University of Leeds	
	Co-Chair (name and title)	Simon Biggs, Head of the institute, Professor	
	Cooperating Institutions	0	Number of Cooperating Institutions 0

Australia	Core Institution	Particulate Fluids Processing Centre, The University of Melbourne	
	Co-Chair (name and title)	Geoff Stevens, Director, Professor	
	Cooperating Institutions	0	Number of Cooperating Institutions
			0

Germany	Core Institution	Institute of Particle Technology, Friedrich-Alexander-University Erlangen-Nuremberg	
	Co-Chair (name and title)	Wolfgang Peukert, Director, Professor	
	Cooperating Institutions	Max Planck Institute for Polymer Research-Mainz (Dr. Hans-Jurgen Butt, Director)	Number of Cooperating Institutions
			1

Switzerland	Core Institution	Particle Technology Laboratory, Swiss Federal Institute of Technology Zurich	
	Co-Chair (name and title)	Sotiris E. Pratsinis, Director, Professor	
	Cooperating Institutions	0	Number of Cooperating Institutions
			0

Objectives of Research Exchange (including the five years after the project finishes)

The research of Particle Technology in Japan has 50 years' history, in such a way that laboratories in Department of Chemical Engineering of Kyoto University have been the leading institute. Three well-organized institutes on Particle Technology, which are all our partner institutes in the present program, were established after 1995, by being detonated not only by knowing the importance of Particle technology, but also by the activities in Japan. In Germany, a well-equipped institute on Particle Technology was established last year.

On the other hand, although there are many active laboratories on Particle Technology in Japan, no effective and well-organized institution exists as in abroad. In order to keep leading the researches on particle technology, it is inevitable to have some center connecting at least the active laboratories in Japan closely and inter-disciplinarily.

Based on the strong international and domestic networks established through many seminars, collaboration researches and visits to the partner institutes during the program "Integrated Action Initiatives" for the first two years, an effective, inter-disciplinary integrated Division of Advanced Particle Science and Technology was established within Advanced Engineering Research Center in the School of Engineering, Kyoto University, beyond the walls of faculties in Kyoto University and the other universities. This division is acting as headquarters to strengthen the world-wide network more strongly and to make the members lead the world research on Particle Technology. This activity will reflect to make the education in Kyoto University higher through the system of Advanced Engineering Education Center. Finally, it is hoped that the division will be one of the advanced centers of Particle Technology not only in Japan but also in the world.

Results to the present

As it was aimed, when this program was elevated from “Integrated Action Initiatives” to “Strategic Research Networks” in 2008, the inter-disciplinary Division of Advanced Particle Science and Technology was established within Advanced Engineering Research Center in the Graduate School of Engineering, Kyoto University.

As for the collaboration research works with Universities of Leeds, Florida and Melbourne, and Max Planck Institute in 2008, 7 collaborations are still continuing and 1 collaboration research finished successfully. 8 new international collaboration projects were proposed by young researchers, and three of them have already started. In addition, 8 domestic collaboration projects were newly proposed among Japanese researchers. We expect fruitful results will be obtained from these projects at the end of this program.

As for the seminars in 2008, 8 seminars were planned at first, but 10 seminars were carried finally to exchange the up-to-date information by the combination of 12 foreign distinguished researchers and 24 Japanese young researchers.

As for the visits of Japanese researchers to the partner institutes in 2008, 70 members in total visited the partner institutes and they had the oral presentations there to exchange the information more deeply.

Last year, the “Young Researchers Meeting” was carried out in both the institutes of Erlangen University and Max Planck Institute in Germany, where very active discussions were carried out. The contents of the papers presented there will be published as a special issue of an international journal “Advanced Powder Technology”.

Summary of FY 2009 Exchange Plan

Joint Research

6 international collaboration projects (Project #1~#6) are continuing from last year. In 2009 young researchers start aggressively 8 new international collaboration projects (Project #7~#14) and 8 new domestic collaboration projects (Project #15~#22) through their “face-to-face” contacts for the last three years.

●Continuing International Collaboration Projects

(1) Electro-hydrodynamics Phenomena of Charged Particles

R. Yamamoto (Kyoto Univ.)-S. Biggs (Univ. of Leeds)

(2) Measurement and Application of Charged Particles

S. Matsusaka (Kyoto Univ.)-M.Ghadiri (Univ. of Leeds)

(3) Development of Gadolinium-containing Nanoparticles Applicable for Diagnosis and Neutron-capture Therapy of Cancer

H.Ichikawa (Kobe Gakuin Univ.)-B. Moudgil and P. Sharma (Univ. of Florida)

(4) Mechanism Clarification of Colloidal Crystal Formation Processes

S. Watanabe (Kyoto Univ.)-P.Jiang (Univ. of Florida)

(5) Dry Mineral Processing Using Gas-solid Fluidized Bed

J. Oshitani (Okayama Univ.)-G. Francs (Univ. of Melbourne)

(6) Study on Contact Angle of Polymer Particles on Interfaces

S. Fujii (Osaka Institute of Tech.)-H.Butt and M. Kapple (Max Planck Institute)

●New International Collaboration Projects

(7) Fabrication of Inorganic Nanofibers and its Application to Nanofluid Technology

S. Nagamine (Kyoto Univ.)-Y. Ding (Univ. of Leeds)

(8) Temperature Responsive Polymers as Functional Flocculants

N. Ishida (AIST) - G. Franks (Univ. of Melbourne)

(9) Development of Novel Multiple-Stimuli Responsible Particle as Functional Material

N. Ishida (AIST) - S. Biggs (Univ. of Leeds)

(10) Development of Wet Dispersion Method of Nano-order Particles

K. Gotoh (Okayama Univ.)- W. Peukert (Univ. of Erlangen)

(11) Interaction of particles with Molecular Layers at the Air-water Interface

C. McNamee (Shinshu Univ.)-K. Higashitani (Kyoto Univ.)- H. Butt & M. Kappl (Max Planck Institute)- D. Chan (Univ. of Melbourne)

(12) Self-assembly of Nanoparticle and its Application

K. Sugano (Kyoto Univ.)- W. Peukert (Univ. of Erlangen)

(13) Lattice Boltzmann Simulations of Wetting on Solid Surfaces

H. Shinto (Kyoto Univ.)- Y. Ding (Univ. of Leeds)

(14) Rheological Properties of Coagulated Colloidal Suspensions

Y. Adachi (Tsukuba Univ.)- P. Scales (Univ. of Melbourne)

● **New Domestic Collaboration Projects**

(15) Effects of Solutions on the Friction and Wear of Particle Surfaces

K. Higashitani (Kyoto Univ.)-C. McNamee (Shinshu Univ.)

(16) Mechanism of Shape Formation of Nano Particles Synthesized in Solutions

S. Watanabe (Kyoto Univ.)-S. Morisada (Tokyo Institute of Tech.)

(17) Development of Transportation System of Hydrophobic Drugs of Oil Droplet Type

K. Imamura (Okayama Univ.) – J. Oshitani (Okayama Univ.)

(18) AFM Measurements and Simulation of Pickering Emulsions and Particles

S. Fujii (Osaka Institute of Tech.)-H. Shinto (Kyoto Univ.)

(19) Interaction between Micro-Organisms and Particles

T. Nomura (Osaka Prefecture Univ.) - H. Shinto (Kyoto Univ.)

(20) Simultaneous Measurements of Cells with GFP using AFM and TIRFM

K. Hori (Nagoya Institute of Tech.) - H. Shinto (Kyoto Univ.)

(21) Application of QCM-D and AFM to the Biological Systems

N. Ishida (AIST) - H. Shinto (Kyoto Univ.)

(22) Molecular Simulation using Implicit Solvent Mode

S. Morisada (Tokyo Institute of Tech.) - - H. Shinto (Kyoto Univ.)

Seminar

10 seminars (27th-36th seminars) are planned in 2009, with the aim of bringing the researchers together and exchanging the up-to-date information, which are relevant to the establishment of the strong collaboration system.

We are planning to have 9 seminars in Japan by the heads or leaders of partner institutions and the world-famous distinguished researchers in the field of Advanced Particle Handling Science.

In 35th seminar, which is called “Young Researchers’ Meeting”, more than 30 young researchers camp together to make an intimate correlation. This year it will be held under the guidance of Prof. S. Biggs of the University of Leeds, UK. 14 Japanese researchers will attend the meeting. It is expected that many young researchers from the other partner institutions will also come to participate to this meeting. This meeting enables the young researchers to exchange their ideas and to establish themselves a global network for the future collaboration.

Researcher Exchanges

The information exchange among researchers is, of course, possible through their collaboration works and seminars in Japan, but it is also extremely important for Japanese researchers to experience directly what is going on in the partner institutes and to have a small seminar there to know each other personally. The plan to visit partner institutes this year is shown below, although the concrete date is not fixed yet because of the partners’ circumstances. The plan is scheduled such that the visit date of researcher exchange and the collaboration period of research collaborators with the partner institutes overlap each other to make this seminar more fruitful and also to save the expenses and time. In this program, it is compulsory to have a seminar in the partner institute.

Japanese researchers will be sent to the partner institutes as follows.

- (1) University of Leeds: 20 researchers.
(5 Collaborative Researchers, and 15 Young Researchers Meeting Participants)
- (2) University of Florida: 6 researchers.
(2 Collaborative Researchers and 4 Researchers Exchanges)
- (3) The University of Melbourne: 7 researchers.
(5 Collaborative Researchers and 2 Researchers Exchanges)
- (4) Friedrich-Alexander-University Erlangen-Nuremberg: 5 researchers.
(4 Collaborative Researchers and 1 Researcher Exchanges)
- (5) Max Planck Institute for Polymer Research-Mainz: 6 researchers.
(4 Collaborative Researchers and 2 Researchers Exchanges)
- (6) Swiss Federal Institute of Technology Zurich (ETH): 2 researchers.
(2 Researchers Exchanges)