

14TH INTERNATIONAL CONFERENCE ON ELECTORRHEOLOGICAL FLUIDS AND MAGNETORHEOLOGICAL SUSPENSIONS (ERMR2014)

GRANADA, SPAIN
JULY 7 – 11, 2014

More than two decades have now passed since 1991, when at Southern Illinois University at Carbondale, Illinois, USA, Rongjia Tao organized the International Conference on Electrorheological Fluids considered the starting point of the current ERMR International Conference series. Along these years the fields of electrorheology and magnetorheology have progressed greatly from both the experimental and theoretical viewpoints. At the same time, many applications based on the smart (field-responsive) feature of electrorheological (ER) and magnetorheological (MR) systems have been developed, both in engineering and biomedicine. We could without any doubt state that this field of research has reached its maturity, and as such some commercial applications of these ER and MR systems are available since years ago. At the same time, new physical phenomena related to the interaction of particles, fluids and suspensions with force fields (both magnetic and electric) are continuously appearing, which require new theories and models for their understanding and that might someday give rise to novel applications.

Within this context, the ERMR2014 conference was a platform for meeting, discussions and exchanges of scientific and technological knowledge, between more than 150 researchers of this field from 24 countries of

all over the world. A total of 165 works were presented at the conference, including 17 plenary lectures, 3 invited talks, 79 oral presentations and 66 poster presentations.

The scientific program included 9 session topics. (1) MR suspensions: Physical properties and dynamic behavior. Plenary lectures on this topic were given by Georges Bossis (CNRS and University of Nice-Sophia Antipolis, France) that opened the conference with his recent work on the use of functionalized microfibers for field responsive materials and biological applications, and Masami Nakano (Tohoku University, Japan) that presented first results on the magnetorheology of novel MR fluidic powder. (2) Materials selection and preparation in field-responsive fluids. Hyoung Jin Choi (Inha University, South Korea) discussed the potentiality of graphene oxide as a material for electrorheological and magnetorheological applications in his plenary lecture within this topic. (3) New experimental approaches. The plenary lecture on this topic was given by William Kordonski (QED Technologies International, Inc., USA) on the strengthen effect arising from the controlled compressive deformation of magnetized MR fluids. (4) ER fluids: Physical properties and dynamic behavior. On this topic, Rongjia Tao (Temple University, USA) lectured on the use of electrorheology for the suppression



Figure 1: The Alhambra, a UNESCO World Heritage Site located in Granada, Spain.

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Figure 2: Group photo of the ERMR2014 conference.

of turbulence and the enhancement of flow output, with applications in the transport of oil by pipelines, whereas the lecture of Weijia Wen (The Hong Kong University of Science and Technology, Hong Kong) was on the use of electrorheological fluids in microfluidic systems to achieve active and precise control of fluid by electrical fields. (5) MR Elastomers, gels and foams: Synthesis, physical properties and applications. Plenary lectures on this topic were given by Stefan Odenbach (Dresden University of Technology, Germany) who talked about the microstructure of magnetorheological elastomers using X-ray microcomputed tomography, and Orlin Velev (North Carolina State University, USA) that discussed and illustrated some strategies for making novel magnetically responsive classes of soft matter (foams and gels), based on polarizable particles embedded into biopolymer or lipid multiphase matrixes. (6) Modeling, simulation and control theories. The plenary lecture of Andrey Yu Zubarev (Urals Federal University, Russia) on this topic was about the theoretical modeling of the magnetic field-induced deformation in magnetic gels. (7) Engineering applications of MR sus-

pensions and ER fluids. Three plenary lectures were given on this topic by Norman M. Wereley (University of Maryland, USA), Weihua Li (University of Wollongong, Australia) and Seung-Bok Choi (Inha University, South Korea) on the shear rate magnetorheological flows in impact energy absorption problems, the use of magnetorheological technology for high-speed trains, and the recent applications of engineering technology using ER and MR fluids in Korea, respectively. (8) Emerging systems: field-driven colloids. On this topic, Alexei Snezhko (Argonne National Laboratory, USA) reviewed the state-of-the-art of emergent dynamics and self-assembly in driven magnetic suspensions at liquid interfaces, Pietro Tierno (University of Barcelona, Spain) discussed on the colloidal transport on magnetic garnet films, and James E. Martin (Sandia National Laboratories, USA) lectured on the generation of controlled fluid motion by time-dependent electric or magnetic fields. (9) Biomedical and pharmaceutical applications of field responsive fluids and suspensions. Plenary lectures on this topic were given by Claire Wilhelm (CNRS and University Paris Diderot, France) that discussed on



Figure 3: Discussion and scientific exchange at one of the poster sessions.

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the applications of magnetic cells in building and imaging tissues, and Ricardo Ibarra (University of Zaragoza, Spain) that reviewed the current state of the art and presented perspectives on the induced death of cells by AC magnetic fields and magnetic nanoparticles.

In addition to talks, three poster sessions were held. Two best poster awards were given to promising PhD students in the field of electrorheology and magnetorheology. Recipients of these awards were Shuai-shuai Sun (University of Wollongong, Australia) and Martin Cvek (Tomas Bata University in Zlin, Czech Republic), for their works entitled “Improving train’s ride comfort with a variable Stiffness and Damping Suspension System” and “Magnetorheology of suspensions based on carbonyl iron particles coated with poly(glycidyl methacrylate)”, respectively.

The scientific program was finally complemented with a round table for discussion. This round table was chaired by Fernando Gonzalez-Caballero (University of Granada, Spain), James E. Martin, Rongjia Tao, Stefan Odenbach and William Kordonski, and the debate focused on present challenges of the conference series on ER and MR systems and directions to be taken to guarantee the success of forthcoming ERMER conferences. There was consensus about enlarging the scope of the ERMER conference series and slightly changing its title in order to include the emerging areas of scientific research related to the use of electric and magnetic fields to control the flow properties of soft matter. This task of ensuring the success of the next international ERMER conference was entrusted by the International Advisory Committee (IAC) to Seung-Bok Choi and his team (Inha University), which will organize it in South Korea in 2016.

In addition to the pure scientific program, an extensive cultural and social program was organized, which included a welcome cocktail, a flamenco dancing show, a guided evening visit to the Alhambra and a gala dinner.

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