

PREFACE

By this issue the Magnetohydrodynamics Journal starts the publication of the selected papers of the Joint 15th Riga and 6th PAMIR International Conference on Fundamental and Applied MHD. The papers covering the field of magnetic liquids, magnetism in biology, magnetorheology and electrohydrodynamics open the series of the special issues.

The subjects of the papers included in the present issue prove the enormous broadening of the field of research devoted to the effects of electromagnetic fields in different liquid media. This development is so significant that possibly the term “soft magnetic matter” would be proper to characterize the field. The invited paper by M. Winklhofer, who reviews the state of arts in the field of the so-called magnetotactic bacteria and other organisms containing the magnetic particles, opens the issue. Among the most spectacular achievements in this field, the discovery of the genetic mechanisms responsible for the synthesis of the chains of magnetosomes in bacteria may be mentioned. Very important practical applications resting upon the use of magnetic nanoparticles are associated with the creation of new tools for biodiagnostics and magnetically targeted drug transport. The papers by D. Eberbeck *et al.* and I. Segal *et al.* are devoted to this fast developing area of research. One of the most impressive recent successes in the field of soft magnetic matter is the acknowledgment that by using the electromagnetic interactions it is possible to create active systems, which can control the liquid flow in the microcapillaries and other effects e.g., “negative” viscosity effect, flexible magnetic swimmers. The papers by A. Engel and M. Ozols *et al.* belong to this exciting field of research.

Recently, the heat and mass transfer in magnetic colloids has been recognized to have intriguing features due to the action of self-magnetic fields of the media – renormalization of the diffusion coefficient due to long-range magnetic interactions, and others. Alongside it has been found that the non-uniform self-magnetic fields can give rise to various microconvective phenomena. This field of research is presented in the current issue by the contributions from A. Mezulis *et al.*, V. Frishfelds *et al.* and G. Kronkalns *et al.* Significant role in the manifestation of different microconvective instabilities and mass transfer belongs to the properties of the magnetic particles. The papers by J. Štelina *et al.* and M.M. Maiorov *et al.* are concerned with this important problem.

Starting from the very beginning of the research in the field of magnetic fluids, it is known that unique and very spectacular interfacial phenomena can take place in magnetic fluids such as the so-called Rosensweig spike instability, the formation of labyrinthine patterns in the Hele–Shaw cells, etc. In the current issue, the interfacial phenomena, occurring in magnetic fluids, are illustrated by the papers by R. Ballou *et al.* and V.A. Naletova *et al.*

Some problems in the fast developing field of magnetorheology are discussed in the paper by R.Saldivar-Guerrero *et al.*

Contrast media for imaging by NMR tomography, hyperthermia in the alternating magnetic fields should be mentioned among various new applications of the magnetic nanoparticles. Recently the interest of researchers is focused on the possibility to improve the insulating properties of different fluids by adding the magnetic nanoparticles. This field of research is exemplified in the issue by the paper of P. Kopčanský *et al.*

The organizers of the Joint 15th Riga and 6th PAMIR Conference and the editors of the Magnetohydrodynamics Journal anticipate that the publication of the selected papers of the Conference will encourage the researchers to work more actively in the fast developing field area of the soft magnetic matter research.

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