

—Conference Report —

THE 6TH JOINT MMM—INTERMAG CONFERENCE **ALBUQUERQUE, NEW MEXICO, USA, 20—23 JUNE 1994**

The conference covered the main aspects of magnetism including: recording media and heads, magnetic microscopy and imaging, magnetic materials, magnetostrictive and resistive materials, as well as magnetic separation. Included with this report are a number of papers that took my interest.

A system has been devised by Sasada et al., to monitor remotely the torque on a drill. By using the magnetostrictive effect of the drill, the changing torque produces a changing magnetic field, which is detected by sensing coils. With this technique it is envisaged that an intelligent control of machine tools could be produced. Another sensing system (Nath et al.) has been developed to detect cracks in ferromagnetic materials. This is done by detecting perturbations of eddy currents as they pass around the cracks.

Cugat and Coey have produced permanent-magnet variable-flux sources. They have used magnet cylinders to mirror the effect of a "magic cylinder" and by rotating the cylinders, a varying homogeneous magnetic field can be produced. Depending on the remanence of the magnetic material and the precise configuration, a field up to 1 T can be achieved with no continuous expenditure of energy. On a similar theme, Leupold and McLane's paper describes methods to simplify the manufacture of cylindrical-multipolar and spherical-dipole sources.

A potential new grade of permanent magnetic materials was described in the session concerning nano-composite magnets. An iron-rich composition of either Nd-Fe-B or Sm-Fe-N is melt-spun to produce nanometre-sized grains of α -iron and the magnetic material. Because of the small size, there is coupling between the two different types of grain, leading to an enhanced remanence in the final magnet. It is envisaged that polymer-bonded magnets made from this material would have properties and cost between sintered Nd-Fe-b and polymer-bonded Nd-Fe-B.

The magnetic separation was a poster session and included contributions from U.K. and U.S.A. Gerber and Lawson gave details of their magnetic cage filters, devices designed to remove "crud" from water in power stations. The cages comprise either ferrite or Sm-Co magnets arranged into an array as to maximise capture but minimise flow impedance. An eight-layer Sm-Co magnetic cage was successful in treating a 100 ppb crud suspensions for over a year, with only a few percent fall in efficiency.

Fletcher and Gerber presented a study of the effect of the field profile in a single-boundary eddy-current separator. The theoretical trajectories of small particles have been derived, so that the position of the beam splitter can be calculated. The predictions have been tested and the model vindicated. The work

suggests that this technique can be used to separate fairly small particles. Further work (Fletcher et al.) tested the system with a mixture of randomly shaped aluminium and plastic. Again, this was found to agree well with theory.

Li and Watson gave further details of their investigation of vortex magnetic separation. In this study, a high-speed video camera has been used to analyse particle trajectories around a single magnetised wire. Amongst the conclusions is the discovery that with too higher field from the wire, the particle capture was reduced due to the effect of the upstream magnetically attractive region and the magnetically repulsive region on the wire.

Freeman et al. have devised a magnetic hydrocyclone to thicken magnetite suspensions. The design overcomes the problems encountered with previous models, in that there is no water entrainment with the collected solid product. The performance of the device was such that a slurry containing 10 g/l solids could be cleaned to 50 mg/l with four passes of the magnetic hydrocyclone.

Liu and Friedlaender presented a paper titled "Selective collection of non-magnetic rutile and quartz by means of a magnetic reagent by HGMS". Mineral capture was studied as a function of pH and zeta potentials were measured. They have found that with a slurry of a pH \approx 3 both quartz and rutile were collected on a single magnetised wire. With an increase in the pH, however, only rutile was captured.

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THE SEMINAR "ESSENTIAL ROCK MAGNETISM"
VRIST, CZECH REPUBLIC, SEPTEMBER 12-15, 1994

The seminar "Essential Rock Magnetism – Theory–Instruments–Measurements, Applications" was held in Vrist (Czech Republic), some 75 km NW from Brno, in the heart of the Bohemian–Moravian Highlands, on september 12–15, 1994. The seminar was led mainly by F. Hrouda and V. Jelinek, two of principal researchers from Geofyzika Brno. It was attended by 12 scientists from Czech Republic, Germany, Italy, the Netherlands, Romania, Spain and South Africa, all of them involved in rock magnetism research.

The aim of the seminar was to explain the use of instruments manufactured by Geofyzika Brno, with insight into physical theories, measuring principles, paleomagnetic and anisotropy applications. The seminar focused mainly on low-field magnetic susceptibility and its anisotropy (AMS) in rocks. Special attention was paid to the study of the AMS as a sensitive, fast and relatively inexpensive technique of petrofabric determination. The potential of the method was illustrated by several examples of applications in a wide range of geological problems.

Lectures on the theory of measurements were supported by practical demonstrations of the instruments. Some additional topics concerned the anisotropy of magnetic remanence on rocks and an overview of recent developments in environmental rock magnetism.

In particular, the seminar was presented in twelve lectures. The dominating themes concerned:

- the physical background of the AMS in rocks
- theory of measurement and instrumentation (with examples and demonstrations)
- mathematical theory for the computation of the susceptibility tensor of single specimens and for tensorial statistics on groups specimens
- the application of AMS studies to the evaluation of: 1) the strain evolution and strength in regional metamorphism, 2) the mode of emplacement of magmatic bodies (lava flows, tuffs, plutons...)
- the dependence of bulk magnetic susceptibility on temperature as an indicator of the magnetic mineralogy
- the anisotropy of isothermal remanent magnetisation and characteristics of the ferrimagnetic fabric
- the application of (bulk) susceptibility studies to solve various geological problems.

A new software package, developed by Geofyzika Brno, was also described in detail and distributed to the participants. Individual programs have been designed for advanced processing of the AMS data measured on the KLY-2 and KLY-3 kappa bridges.

An extensive treatment of several arguments covered during the seminar can be found in *The Magnetic Anisotropy of Rocks* by D.H. Tarling and F. Hrouda, published by Chapman and Hall, London (1993).

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