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EMMA–MRM

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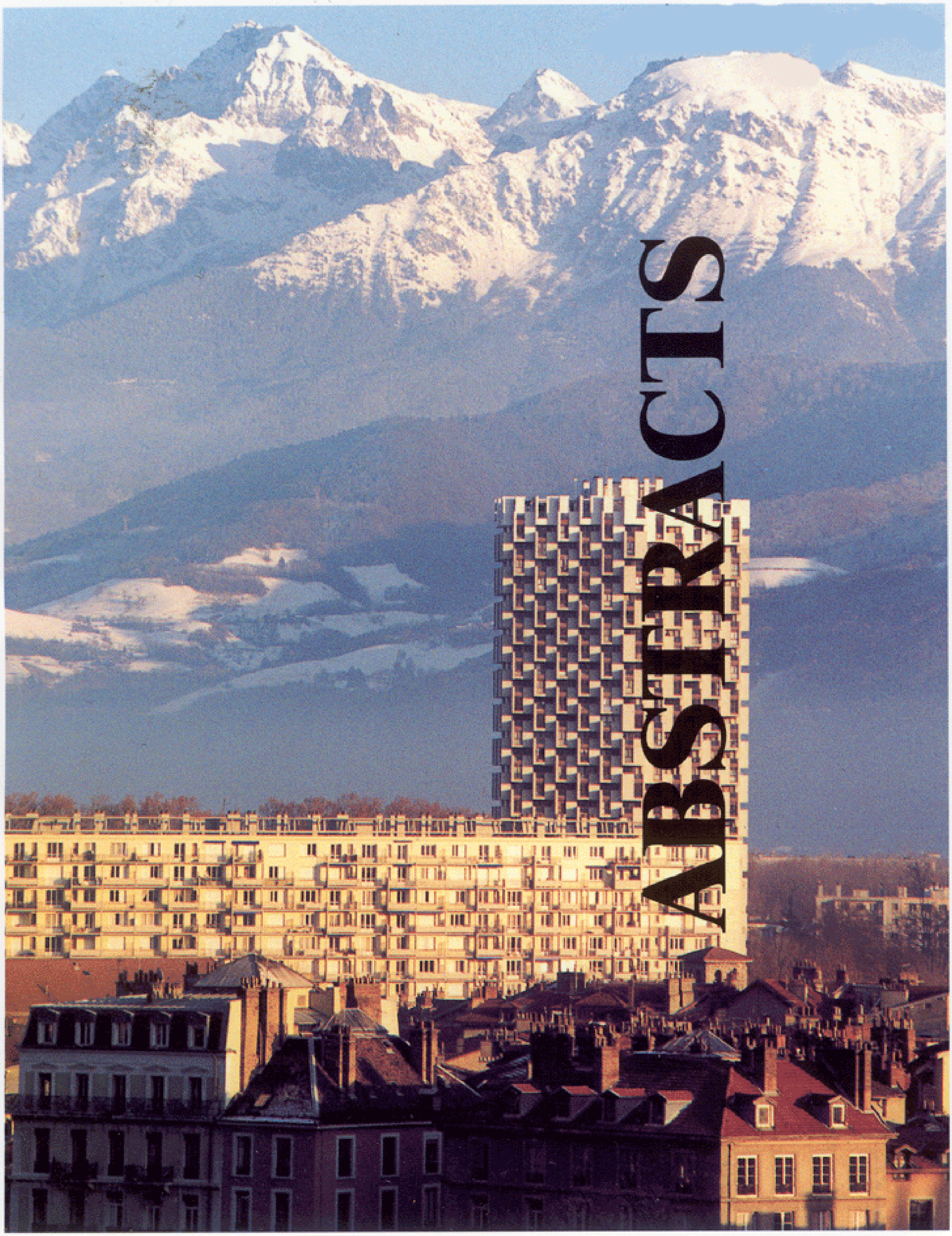

Fr-G-P7 G016

MAGNETO-OPTICAL ROTATIONAL VELOCITY SENSOR

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Magnetooptical rotational velocity sensors combine advantages of optical and magnetic methods of measurements. The measurement information can be transmitted via optical fibers thus canceling problems of electromagnetic interference and potential isolation. On the other hand the light path can be restricted by a small closed compartment outside the rotating body thus canceling requirements to the environment (clear air, no obstacles along the optical path, etc.).

We are developing a new magnetooptical rotational speed sensor based on orthoferrite crystals[1]. Orthoferrites possess a strong uniaxial magnetic anisotropy, high domain wall mobility and high Neel temperatures combined with a high optical transparency.

Experiments have shown a very wide dynamic range of these measurements. It starts from a speed as low as 0.01 revolutions per minute (the lower limit only depends on the electronic evaluation method, e.g. phase locked loop circuits). The upper limit is restricted by the maximum currently obtainable speeds of rotation.

In our experiments the maximum speed was 37 000 rpm. In fact the sensor can work at much higher speeds: the amplitude of the domain wall oscillations in the alternating magnetic field remains almost unchanged up to frequencies in the MHz range. This provides the opportunity to increase the resolution of instantaneous velocity measurement by performing several readings per revolution.

[1] Y. S. Didosyan, H. Hauser, J. Nicolics and F. Haberl, "Application of orthoferrites for light spot position measurements", J. Appl. Phys. **87**, 7079 (2000).

Fr-G-P8 G017

MAGNETIC SENSORS BASED ON MANGANESE PEROVSKITE THICK FILMS: AMR-ENHANCED SENSITIVITY.

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Manganese perovskites, having the ferromagnetic transition above room temperature, are good candidates to be used as a magnetoresistive sensor. In particular, thick films prepared by screen printing have been shown develop position sensors. So far, the magnetic configurations and the topology of the sensitive circuits have been designed to exploit the magnetoresistance of ceramic films in such a way that the measuring current is always perpendicular to the magnetic field. In this paper an new model will be presented in which we take advantage of the anisotropic magnetoresistance (AMR) . Thick films of $La_{2/3}Sr_{1/3}MnO_3$ have been screen-printed onto polycrystalline Al_2O_3 substrates and magnetoresistive contact-less potentiometers have been build and tested. With the aim of flux guiding, we have also included soft ferrite thick films. It is shown that the AMR contribution can be used to furher enhance the output signal of the potentiometer.

Fr-G-P9 G019

LOW-FIELD MAGNETORESISTANCE IN SOL-GEL DERIVED $La_{2/3}Sr_{1/3}MnO_{3-\delta}$ THICK FILMS

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We have fabricated $La_{2/3}Sr_{1/3}MnO_{3-\delta}$ (LSMO) thick films by a screen-printing technique on various substrates (Si and Al_2O_3). Ceramic LSMO powders were synthesized low temperature (600 °C, grain size ≤3 μm) sol-gel process and to get thick films, powders have been suspended in an organic vehicle made by Alfa-therpineol system. Ranges of sintering condition for LSMO thick films were explored with temperature of 700, 800, 900 and 1100°C in air for 3 hours. Crystalline and microstructure characterization of the thick films has been performed by using Phillips XRD, SEM and AFM. The XRD patterns of the grown thick films can be indexed on the basis of a rhombohedrally distorted pseudo-cubic structure with lattice parameter a=5.465 Å, α=60.37°. Microstructure analysis shows that the grains have spherical shape and the lower sintering temperature results more porous microstructure. The field dependence of the resistivity has been measured by using the four-probes method under fields up to 450 Oe. The maximum MR ratio ($MR=([R_{(H=0)}-R_{(H=Max.Peak)}]/R_{(H=0)})\times100)$), 0.68%, was obtained at 300 K for the sample which was sintered at 1100 °C, that is a MR ratio of 0.0015 %/Oe in the 450 Oe field region. We proposed that this MR ratio is enough to fabricate device, which can be used as a low-cost magnetic sensors.

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DEPOSITION OF Bi SUBSTITUTED IRON GARNET MAGNETO-OPTIC THIN FILMS FOR MAGNETIC FIELD SENSORS APPLICATIONS

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Bi substituted garnet films exhibited a strong magneto-optical effect in the visible and near infrared spectral range. So such garnet films are suitable sensing materials to be used in integrated optical magnetic field sensors. For this application the growth of garnet thin films on glass substrates by an atmospheric aerosol MOCVD process is described. The deposition process is based on the pyrolysis of an ultrasonic generated aerosol, which contained the dissolved organometallic precursors. As source solution yttrium and iron acetylacetonates and bismuth triphenyl were dissolved in butanol at a concentration of 0,03Mol/l. Well adherent 0.5μm thick films can be deposited in the temperature range 470°C - 520°C with deposition rates between 0.1 and 0.5μm/h. The composition of the deposited layers depended on the deposition conditions (substrate temperature, aerosol flow, composition of the source solution). In particular the bismuth incorporation increased drastically with the deposition temperature. Besides the morphological aspect of the films is more uniform and flat for low deposition temperature.

As deposited the films are amorphous with a good transparency. After being annealed during some hours at temperature between 600°C and 650°C, the films with a composition near the stoechiometric value exhibited a pure non textured polycrystalline garnet structure. According to the magnetic measurement performed with a VSM, the complete crystallisation is achieved after 1 hour for samples annealed at 650°C and after 30 hours for samples annealed at 600°C. The optical (refractive index) and magneto-optical (Faraday hysteresis loop) properties have been measured at 633 nm and the results are discussed according to the composition of the films.