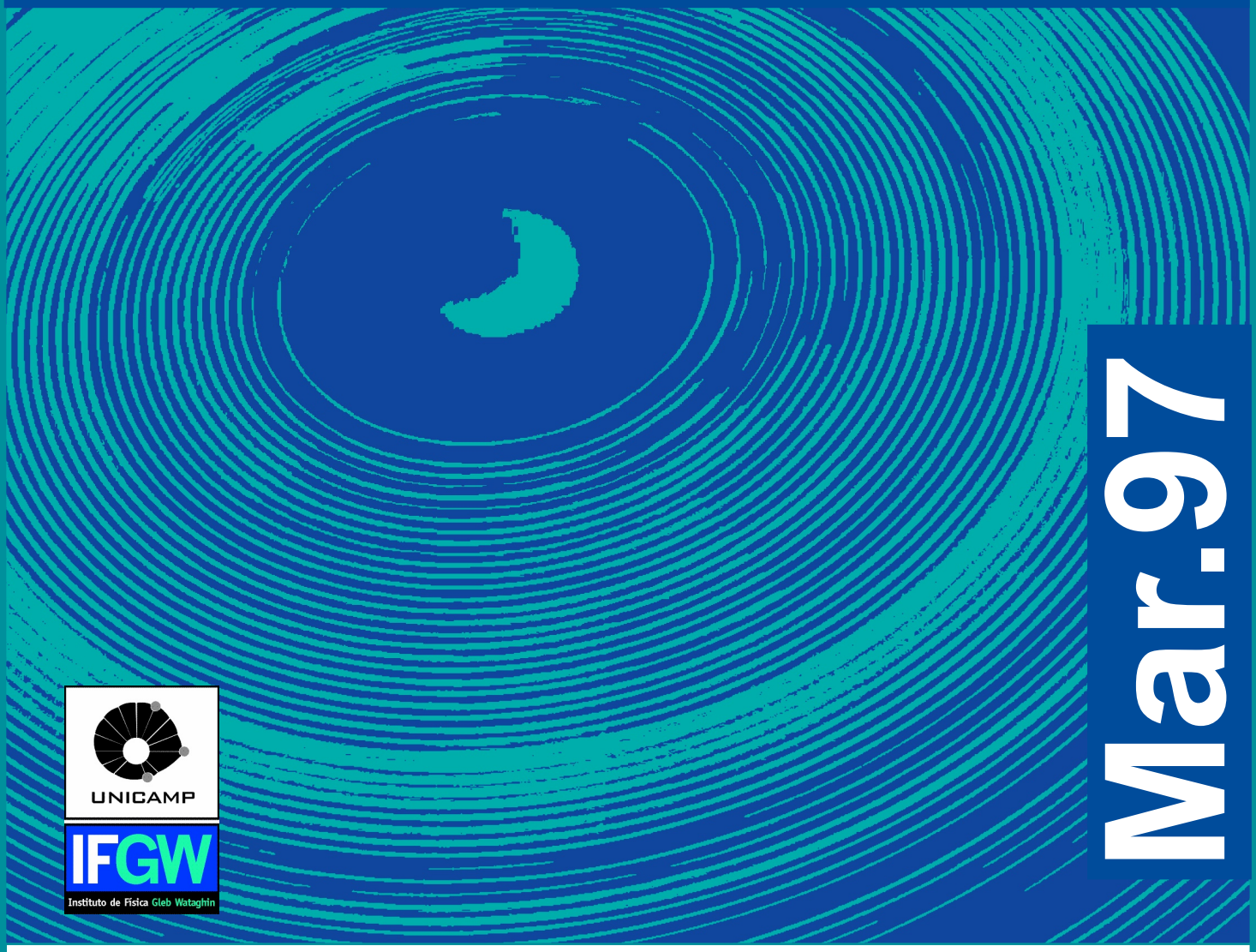
Abstracta

Ano I - N. 03



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Trabalhos Aceitos para Publicação

A005-97 à A013-97

Trabalhos Submetidos à Publicação

P007-97 à P016-97

Accepted papers

[A005-97] "Disorder Induced Asymmetric Magnetization in $Bi_2Sr_2Ca_2Cu_3O_{10}$."

Y. Koplelevich, V. V. Makarov and S. Moehlecke

Magnetization measurements as a function of external magnetic field H_e, temperature T and time t were performed in a c-axis-oriented bulk $Bi_2Sr_2C_2Cu_3O_{10}$ compound sample with H_e applied along the preferential c-axis oreintation. It is found that hysteresis loops , $M(H_e)$, are asymmetric with respect to the equilibrium magnetization M_{eq}, such that an additional magnetization $DeltaM_m = M_m - M_{eq}$ arises for the flux entrance, where $M_m(H_e) = 1/2[M^+(H_e) + M^-(H_e)]$ is the mean magnetization, and M^+, M^-, the magnetization corresponding to the ascending and descending branches of the hysteresis loop, respectively. The time relaxation measurements made in H_e= 1 T indicate that both $M^+(t)$ and $M^-(t)$ dependencies could be best described by the power law $(M-M_{oo}) \sim t^{-b}$, where M_{oo} is obtained from the extrapolation of the relaxation law to t = oo. Above a `` depinning" temperature T_d ~ 20 K, $DeltaM_m$ tends to zero, i. e. $M_{oo}^+ \sim M_{eq}$, whereas at T

Physica C 277 (3-4), 225-232, 1997

[A006-97] "Viscous Drag effect on Imaging of Linearized Plasmid Deoxyribonucleic Acid in Liquid Medium with the Atomic Force Microscope."

O. Teschke, R. A. Douglas, T. A. Prolla

In many attempts to image biomolecules like deoxyribonucleic acid (DNA) with the atomic force microscope, the apparent width of the molecules exceeds the expected width as obtained by X-ray diffraction. This increase in size was explained by a geometrical tip convolution, but hte increased width seems to persist despite improvements to the tip. Experimental evidance is shown that part of this increase is due to the liquid drag force when molecules are imaged under liquid. The liquid drag force is calculated using standard fluid dynamics where the tip motion in the liquid is modeled by the relative motion of a cylinder through a constant velocity fluid. The Reynold's number for the experimental configuration is smaller than 1 characterizing a laminar flow and the calculated drag force is 80 picoNewtons which is in agreement with the experimentally measured force for ethanol and relative tip velocity of 100 micron/s.Both the viscous drag force and the apparent width increase may be be modelled by a v^k dependence where v is the sample velocity relative to the tip, K is a constant independent of the liquid and the tip-sampel geometry and equal to 0.53. An apparent molecular width increase of ~ 30 nm for a ~ 2 nm diameter molecule for a 150 micron/s scanning velocity was observed.

Applied Physics Letters 70 (15), 1977-1979, 1997

[A007-97] "Self-Inductance of Solenoids, Bi-Dimensional Rings and Coaxial Cables."

M. Bueno e A. K. T. Assis

We compare the self-inductance formulae of Neumann, Weber, Maxwell and Graneau. To this end we present exact and algebraic formulae for the self-inductance of solenoids, bi-dimensional rings and coaxial cables. We show that these four formulas agree exactly with one another for closed circuits.

Helvetica Physica Acta 70 (6), 813-821, 1997

[A008-97] "Alignmento of a Mg and Ca Metastable Beam Produced by Discharge."

F. J. da Paixão

Sources of excited atoms in a metastable state produced by a discharge are important tools for several experiments in atomic physics. The axis defined by the electron current breaks the spherical symmetry and as a result, the magnetic sublevel cross section can be different and the atomic beam aligned. It is presented theoretical results for the energy dependence of the magnetic sub-level integral cross section for the 3_1S --> 3_3P Mg 5transition and 4_1S -->4_3P on Ca, They suggest a strong energy dependent alignment at energies where the excitation cross section is also large. Analysis indicates that this may also be true for other atoms. The spin-orbit interaction, neglected during the excitation, is included after the collision. It produces a time dependent density matrix evaluated using state multipole. Collision experiments with these aligned atomic beams may provide information which can not be obtained when the atomic state description is an isotropic density matrix.

Zeitschrift fur Physik D-Atoms Molecules and Clusters 41 (1), 15-18, 1997

[A009-97] "Circuit Theory in Weber's Electrodynamics."

T. Assis

We present a derivation of the equation describing the current flow in a circuit with self-inductance based on Newton's second law plus Weber's force or, alternatively, plus Lorentz or Linénar-Schwarzcchild's force. In Weber's approach the self-inductance can be treated as a measure of the effective average inertial mass of the conduction electrons.

European Journal of Physics 18 (3), 241, 1997

[A010-97] "Gamma-hadron Families Sensitivity to Disoriented Chiral Condensate"

E. Navia, C. R. A. Augusto, F. A. Pinto, S. L. Barroso e E. H. Shibuya

Presented in this study is a possible coherent emission of pions from a large domain of Disoriented Chiral Condensate (DCC) in the leading particle region, through their influence on the development of the gamma-hadron families, initiated by cosmic ray particles in the atmosphere. the production rate of DCC is obtained by using a phenomenological framework in the quenching approximation and is included in a Monte-Carlo Code. In this context, we have found, under the assumption of a "normal" proton dominant composition in the primary flux that the anomalous hadron rich families, observed in the experimental data, can be reproduced. However, the production rate of DCC obtained here is not enough to describe the global characteristics, such as the family flux, observed at mountain altitudes. The implications of these results are here discussed.

Physical Review D 55 (9), 5834-5840, 1997

[A011-97] "Macroscopic Averages in QED in Material Media."

M. Dutra e K. Furuya

This article addresses the problem of whether it is possible to describe the effect of the atoms of material media on the field only in terms of a dielectric constant, in the regime where the field has to be treated quantum mechanically. Using a simple model of a linear lossless material medium, we start from first principles and determine the validity of the approximations required to obtain such a quantum analogue of classical macroscopic electrodynamics. This theory is derived here from the fundamental microscopic QED description of a medium, in terms of its constituent atoms in the vacuum, by taking macroscopic averages of the dynamical variables. The condition of validity of the macroscopic approximation is obtained as the proviso for neglecting the contribution of the atoms of the medium to the quantum noise of the field. We show that macroscopic averaging is compatible with a quantum theory and does not imply any smoothening of the intrinsic quantum fluctuation of the field. Although this theory is based on a simple one dimensional model of a single mode

cavity, it is able to describe the frequency dependence of the dielectric constant.

Physical Review A 55 (5), 3832-3841, 1997

[A012-97] "Mass Balance of Biocarbon Electrodes Obtained by Experimental Bench Production."

R. Coutinho, C. A. Luengo

Biocarbon electrodes (BCE) for specialty applications were produced, bench scale, from biomass. The pyrolysis of wood logs at 10000C yielded charcoal and volatile by-products which were condensed and later distilled to recover the biopitch, utilized as the binding agent. The biocoke was ground and mixed with the binder to obtain the bio-electrode paste. The green electrode was molded at 60 MPa and 1500C. Heat treatments include calcination at 10000C followed by graphitization at 27000C.The physical properties of BCE showed microcrystallite dimensions of Lc= 124 Angstrons and La = 565 Angstrons electrical resistivities of 104 Ohms.m and the mechanical measurements yielded a Young's modulus near 3.0 GPa, rupture strength of 50 MPa and a thermal expansion coefficent of 6.10(-6) C(-1) . The mass balance of the manufacture process indicates 31% of biocoke, 45% of condensed and 24% of volatile materials. The vacuum distillation of condensed fractions resulted in 11.2% of biopitch. Mixing and molding of biocoke with biopitch paste produced the green electrode which was calcined and finally, graphitized. Ultimately, the heat treatment process yields 28.9% of graphitized BCE.

In: Developments in Thermochemical Biomass Conversion, A.V. Bridwater (ed.) vol. 1, 305, 1997

[A013-97] "We present superelastic cross sections of H(2) by electron impact."

Sartori, F. J. Paixão e M. A. P. Lima

Our results, obtained with the Schwinger Multichannel method, include cross sections for the c^3Pi_u --> $X^1Sigma^+_g$, c^3Pi_u --> $b^3Sigma^+_u$, c^3Pi_u --> $a^3Sigma^+_g$, and elastic c^3Pi_u --> c^3Pi_u , transitions. The calculated cross sections are very large, indicating their importance in the modeling of discharge environments. We also investigate the dependence of these cross sections on the internuclear separation of the H atoms and on different approximations of the target wave function. To assess the role of the exchange potential in these processes, we also present the corresponding polarization fractions.

Physical Review A 55 (4), 3243-3246, 1997

Submitted papers

[P007-97] "Resonancia Paramagnética Electrónica en Metales."

G. E. Barberis

A partir del trabajo pionero de Feber y Kip y de la teoria de formas de línea desarrollada simultáneamente por Dyson, el estudio de momentos magnéticos en metales por medio de la resonancia paramagnética electrónica ha recorrido un largo camino, sirviendo de método de estudio de metales con propiedades tan diversas como compuestos de valencia intermedia, superconductores de tipo II, y permitiendo observar propiedades tales como el campo cristalino local en el metal, los valores de parámetros de intercambio entre una impureza y los electrones de condicción, y otras. Este capítulo presenta una revisión de los trabajos realizados en este asunto desde 1955 hasta nuestros dias, con énfasis en los aspectos que hoy dia hacen de esta técnica una herramienta extremadamente útil para estudiar momentos magnéticos en sólidos.

In: Espectroscopía de RPE, T. Rojo, L. Lezama and J. M. Barandiarán (eds.), 207-223, 1997

[P008-97] "Electron Spin Resonance Study of Fe^{3+} in $LiNbO_3$ Single Crystals: bulk and fibres."

R. C. Santana, M. C. Terrile, A. C. Hernandes, M. R. B. Andreeta e G. E. Barberis

We present the ESR spectra and angular variations of both the line positions and linewidths for Fe^{3+} in $LiNbO_3$ single crystals grown by the Czochralski method and by laser-heated pedestal growth. The spectra prove the high quality of the fivres and show that ESR is a good method to characterise these optical materials.

Solid State Communications 103 (1), 61-64, 1997

[P009-97] "Environment of the Rare-Earth in Epitaxial $Ca_{1-x}Er_xF_{2+x}$ Thin Films."

A. S. Barrière, T. Césaire, L. Hirsch, B. Porté, G. Villenueve, L. Lezama, T. Rojo e G. E. Barberis

We present Er_{3+} environment studies in $Ca_{1-x}Er_xF_{2+x}$ thin films epitaxially grown on silicon and CaF_2. Several techniques were used in the characterization of the films, with the aim to interpet their optical properties. Photoluminescence, EXAFS and ESR studies show that the films present fewer cluster that Er_{3+} diluted in the bulk CaF_2, making the films more interesting to be used as optical devices.

Journal of Applied Physics 84 (7), 3654-3657, 1998

[P010-97] "Magnetic Properties of the $Limpo_4$ (M=Co, Ni) Compounds."

A. Goni, L. Lezama, G. E. Barberis, J. L. Pizarro, M. I. Arriortua and T. Rojo

Samples of $LiNiPO_4$, $LiCoPO_4$ together with $LiMgPO_4$ doped with 0.1% of Co^{2+} were prepared by reactions in solid state. Magnetic susceptibility measurements of the $LiNiPO_4$ and $LiCoPO_4$ compuonds are consistent with a 3D antiferromagnetic behaviour. The magnetic exchange value for the $LiNIPO_4$ phase is -5.61K, with a g value of 2.15. The EPR study of $LiMgPO_4$ doped with 0.1% of Co^{2+} shows the large magnetic anisotropy of the Co^{2+} ion in a distorted octahedral geometry. The obtained values for the spin Hamiltonian parameters are g_1= 6.16, g_2= 4.14, g_3= 2.53 and A_1= 246 10^{-4}, A_2= 89 10^{-4} and A_3 <20 10^{-4} cm^{-1}.

Journal of Magnetism and Magnetic Materials 164 (1-2), 251-255, 1996

[P011-97] "Fluorescence and Magnetooptics of Er^{3+} in $Ca_3Ga_2Ge_3O_{12}$ Garnet."

R. C. Santana, L. A. O. Nunes, H. C. Basso e M. C. Terrile e G. E. Barberis

We report fluorescence, magnetooptics and light absorption studies of Er^{3+} in $Ca_3Ga_2Ge_3O_{12}$ both at room and liquid helium temperatures. We found that several sites are occupied for the Er^{3+} ions, which substitute Ca^{2+}, corresponding with different charge compensation in the Er^{3+} neighborhood. Here we present the complete optical study of the most populated of these sites. We compare our results with previous ESR experiments in similar samples, and other rare-earth optical experiments in the same host.

Solid States Communications 106 (7), 463-468, 1998

[P012-97] "^7Li and ^{31}P Nuclear Magnetic Resonance studies of $LiMgPO_4$."

A. Goñi, T. Rojo,T. J. Bonagamba, M. A. Silva. H. Panepucci e G. E. Barberis

We report Fourier transform NMR spectra and spin-lattice relaxation rates for ^{7}Li and ^{31}P in $LiMgPO_4$, in the temperature range from 150 to 390 K. The ^{7}Li spectra show quadrupolar splitting, together with temperature independente spin-lattiece ralaxation times, confirming that the olivine structure is particularly stable, and giving some hint respect to the relaxation of structure and superionic Li conductivity. Isostructural $LiMPO_4$ (J= Ni, Co) compounds were studied as matter of comparison.

Journal of Applied Physics 84, 416, 1998

[P013-97] "ESR Spectroscopy of Co^{2+} in single crystals of $NH_4NiPO_4.6H_2O$."

A. Goñi, L. M. Lezama e T. Rojo, J. A. Valdivia e G. E. Barberis

Experiments of Electron Spin Resonance (ESR) were performed on Co^{2+} in single crystal and powder samples of $NH_4NiPO_4.6H_2O$. The angular variation of the resonance field of cristalline sample, can be interpreted in terms of two magnetically non equivalent sites related by a symmetry operation. From the fitting of the ESR data, the spin hamiltonian parameters are determined.

Physical Review B 57 (1), 246-251, 1998

[P014-97] "Informational Statistical Thermodynamics and Thermal Laser Stereolithography."

R. Luzzi, M. A. Scarparo, J. G. Ramos, A. R. Vasconcellos, M. L. Barros, Z. Zhiayao, A. Kiel

We consider the nonequilibrium thermodynamic aspects of the techno-industrial process of thermal laser stereolithography.The conditions necessary for a satisfactory process of rapid prototyping to follow are characterized and discussed. We show that the process is best described in terms of modern theories of nonequilibrium thermodynamics of disssipative syustems. Nonconservative fluxes need be introduced as basic variables, quite in the spirit of extended irreversible thermodynamics, to explain the experimental results. We also show that by varying the thermal properties of the material, the restricted domain of validity of the traditional classical irreversible thermodynamics is reached: to have diffusive motion predominanting over long-range-propagating undulatory motion is fundamental for the technique.

Journal of Non-Equilibrium Thermodynamics 22 (3), 197-216, 1997

[P015-97] "ESR of Gd^{3+} in the Magnetically Ordered Eu_2CuO_4."

C.Rettori, S. B. Oseroff, D. Rao, J. A. Valdivia, G. E. Barberis, G. B. Martins, J. Sarrao, Z. Fisk, M. Tovar

Physical Review B 54 (2), 1123-1127, 1997

[P016-97] "Inhibitory Effect of Dipyridamole and its Derivatives on Lipid Peroxidation in Mitochondria."

M. F. Nepomuceno, A. Alonso, L. Pereira-da-Silva e M. Tabak

Dipyridamole(DIP)2,6-bis(diethanolamino)-4,8-dipiperidino-[5,4-d]pyrimidine, is a coronary vasodilator widely used in clinics. It has been also reported coactivator activity for a number of antitumour drugs and antioxidant activity in membrane systems. In recent years we have been studying the spectroscopic properties of this drug and several of its derivatives as well as their interaction with charged micelles and phospholipid monolayers. A stronginteraction of DIP and DIP derivatives with these model membrane systems,and a dependence of the strength of the interaction upon the chemical structure of the DIP derivative was observed. Here, the antioxidant effectof DIP and the derivatives, RA14, RA47 and RA25, was compared. We observed that although it strongly inhibits the iron induced lipoperoxidation on mitochondria (IC50= 1 mM), it shows no protection against an organic oxidant, cumene hydroperoxide. The order of hydrophobicity of the DIP derivatives, DIP > RA14 > RA47 > RA25, correlates verywell with both the values of the association constants of these derivatives to micelles, their localization in the micelles and phospholipid films and their antioxidant effect on mitochondria. So, a very good correlation of the structure of the drug as regarded to the nature of its substituents with the biological activity is observed. Essentially the same result was observed either measuring the lipid peroxidation or the membrane fluidity by ESR, suggesting that the effect of DIP and DIP derivatives is probably associated to their binding to the lipid bylaier and not to interaction with membrane proteins. Keywords - Dipyridamole (DIP) and its derivatives, lipid peroxidation, membrane fluidity, mitochondria, oxidative stress, free radicals.

Free Radical in Biology e Medicine 23 (7), 1046-1054, 1997

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Abstracta

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