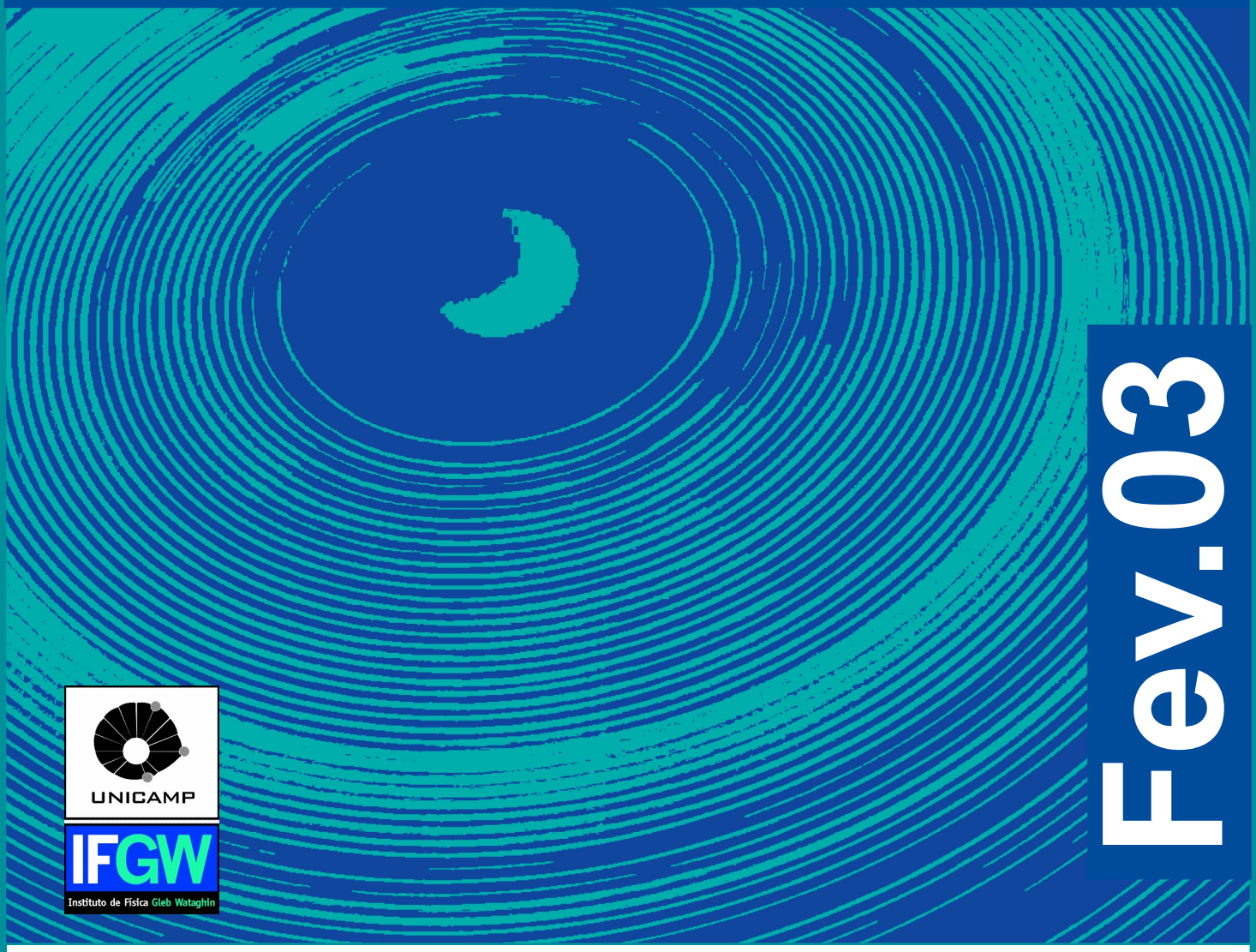
# Abstracta

Ano V - N. 01



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## Trabalhos Publicados

P001-03 à P039-03

# Trabalhos Publicados

**P001- 03 "A comparative study of elastic scattering of low energy electrons by boron, aluminum and gallium trihalides"**

da Costa, R. F., Ferreira, L. G., Lima, M. A. P., and Bettega, M. H. F.

In this paper we present integral, differential and momentum transfer cross sections for elastic scattering of low-energy electrons by some metal-halogen molecular compounds, namely, BF3, BCl3, BBr3, BI3, AlF3, AlCl3, AlBr3, AlI3, GaF3, GaCl3, GaBr3, and GaI3. The pseudopotential based calculations were carried out with the Schwinger multichannel method at the static-exchange level of approximation. It is the purpose of this work to make a comparative study of the scattering processes involving aluminum and gallium trihalides with previous results for the boron ones [M. H. F. Bettega, Phys. Rev. A 61, 042703 (2000)]. We find through direct comparison of the elastic cross sections that, at low energies, the scattering processes are mainly dominated by the halogen atoms.

**Journal of Chemical Physics 118[1], 75-82. 2003.**

**P002- 03 "A Monte Carlo model of the MCD behavior of hematite colloids"**

de Castro, A. R. B. and Zysler, R. D.

We made Monte Carlo simulations of the energy distribution and magnetic moment contributions of surface and core sites in a model particle of spherical shape, intended as a simple representation of hematite colloids. We included exchange interactions between nearest neighbors, plus anisotropy and Zeeman energy terms. Model particles built with origin between lattice sites show a temperature dependence of magnetization consistent with previous measurements and explain the puzzling results of magnetic circular dichroism in samples of nanostructured hematite recently obtained with synchrotron radiation.

**Journal of Magnetism and Magnetic Materials 257[1], 51-57. 2003.**

**P003- 03 "Erratum to: A proposal of quantum logic gates using cold trapped ions in a cavity (vol 299, pg 423, 2002)"**

Semiao, F. L., Vidiella-Barranco, A., and Roversi, J. A.

**Physics Letters A 306[1], 62-62. 2002.**

**P004 - 03 "Absence of metal-insulator transition and coherent interlayer transport in oriented graphite in parallel magnetic fields"**

Kempa, H., Semmelhack, H. C., Esquinazi, P., and Kopelevich, Y.

Measurements of the magnetoresistivity of graphite with a high degree of control of the angle between the sample and magnetic field indicate that the metal-insulator transition, shown to be induced by a magnetic field applied perpendicular to the layers, does not appear in parallel field orientation. Furthermore, we show that interlayer transport is coherent in less ordered samples and high magnetic fields, whereas appears to be incoherent in less disordered samples. Our results demonstrate the two-dimensionality of the electron system in ideal graphite samples.

**Solid State Communications 125[1], 1-5. 2003.**

**P005 - 03 "Arsenic segregation, pairing and mobility on the cores of partial dislocations in silicon"**

Antonelli, A., Justo, J. F., and Fazzio, A.

We studied the effects of arsenic on properties of dislocations in silicon. The theoretical investigation was carried out using ab initio total energy methods, based on the density functional theory. We find that the interaction of an arsenic impurity in the crystal with a dislocation results in a charge exchange, driving the dislocation core to a negative charge state. This interaction is essentially electrostatic and attractive, and leads to arsenic segregation. Although arsenic segregation to the core is energetically favourable, formation of arsenic pairs inside the core is energetically unfavourable. We also investigated the role of vacancies in arsenic diffusion inside the dislocation core.

**Journal of Physics-Condensed Matter 14[48], 12761-12765. 2002.**

**P006 - 03 "Blocking phenomena in granular magnetic alloys through magnetization, Hall effect, and magnetoresistance experiments"**

Denardin, J. C., Pakhomov, A. B., Brandl, A. L., Socolovsky, L. M., Knobel, M., and Zhang, X. X.

Magnetization and magnetotransport were measured in CoxAg1-x granular composites as a function of temperature and applied magnetic field. A transition from blocked to superparamagnetic behavior with increasing temperatures can be observed in magnetization, giant magnetoresistance and the extraordinary Hall effect measurements. However, the blocking temperature determined from magnetotransport measurements is systematically lower than the one estimated from magnetic measurements. This is due to the selective magnetic scattering, which is enhanced for smaller particles, while the magnetization probes the whole particle size distribution.

**Applied Physics Letters 82[5], 763-765. 2003.**

**P007 - 03 "Bounds on direct couplings of superheavy metastable particles to the inflaton field from ultra high energy cosmic ray events"**

Campos, A. H., Lengruber, L. L., Rosenfeld, R., Reis, H. C., and Sato, R.

Top-down models for the origin of ultra high energy cosmic rays (UHECR's) propose that these events are the decay products of relic superheavy metastable particles, usually called X particles. These particles can be produced in the reheating period following the inflationary epoch of the early Universe. We obtain constraints on some parameters such as the lifetime and direct couplings of the X-particle to the inflaton field from the requirement that they are responsible for the observed UHECR flux.

**Modern Physics Letters A 17[33], 2179-2188. 2002.**

**P008 - 03 "Effect of impurities in the large Au-Au distances in gold nanowires"**

Novaes, F. D., da Silva, A. J. R., da Silva, E. Z., and Fazzio,A.

Experimentally obtained atomically thin gold nanowires have presented exceedingly large Au-Au interatomic distances before they break. Since no theoretical calculations of pure gold nanowires have been able to produce such large distances, we have investigated, through ab initio calculations, how impurities could affect them.

We have studied the effect of H, B, C, N, O, and S impurities on the nanowire electronic and structural properties, in particular how they affect the maximum Au-Au bond length. We find that the most likely candidates to explain the distances in the range of 3.6 Angstrom and 4.8 Angstromare H and S impurity atoms, respectively.

**Physical Review Letters 90[3], 036101. 2003.**

**P009 - 03 "Electronic structure investigation of biosensor polymer"**

Del Nero, J., Galvao, D. S., and Laks, B.

We report-a theoretical study of the ground, excited and ionic states of 3-methyl pyrrole-4-carboxilic acid (MPC) oligomers and related compounds which present conformational defects. Our results reveal the existence of differentiated electronic behavior for MPC with relation to oligopyrrole derivatives. These electronic features might explain why MPC works properly as a biosensor for cytochrome C while no voltametric response is observed for unsubstituted poly(pyrrole).

**Optical Materials 21[1-3], 461-466. 2003.**

**P010 - 03 "Enhanced photocurrent in photo-emf experiments in pure and doped absorbing photorefractive crystals"**

Mosquera, L. and Frejlich, J.

We report a mathematical formulation that successfully describes the holographic photocurrent that is produced, in strongly absorbing photorefractive materials, by the action of a pattern of interference fringes of light vibrating sinusoidally with large amplitude. The large vibrating amplitude produces a sensible enhancement of the photocurrent signal and in this way facilitates measurements. We also show that taking account of the bulk light absorption of the sample is essential for adequately describing the experiment. We measure the first temporal harmonic of the photocurrent, without an externally applied field, as a function of the amplitude and the temporal frequency of the vibrating pattern of fringes and show that these data fit our theoretical model well. From this fit we are able to determine some material parameters for pure and doped photorefractive Bi12TiO20 crystals.

**Journal of the Optical Society of America B-Optical Physics 19[12], 2904-2910. 2002.**

**P011 - 03 "Evidence of local and global scaling regimes in thin films deposited by sputtering: An atomic force microscopy and electrochemical study"**

Cruz, T. G. S., Kleinke, M. U., and Gorenstein, A.

The surface morphology of NiOx, thin films deposited by rf sputtering was studied by atomic force microscopy and by cyclic voltammetry. Linear relationships were observed in log-log plots of the interface width versus window length and in log- log plots of the peak current versus scan rate. Two different slopes were observed, by both techniques, indicating that distinct growth dynamics present in the system can be measured in different ways. Moreover, the calculated fractal dimensions are in excellent agreement: the local scaling regime corresponds to high scan rates and the global scaling regime corresponds to low scan rates, in accordance with the expected behavior for diffusion fronts.

**Applied Physics Letters 81[26], 4922-4924. 2002.**

**P012 - 03 "Fission-track dating of a tephra layer related to Poti Malal and Seguro drifts in the RioGrande basin, Mendoza, Argentina"**

Espizua, L. E., Bigazzi, G., Iunes, P. J., Hadler, J. C., and Osorio, A. M.

Two old drift units called Poti-Malal and Seguro have been differentiated in the Rio Grande basin based on relative-age criteria, stratigraphical relationships, morphology and fission-track dating. A tephra dated at 0.226+/-0.025 Ma was deposited on the Poti-Malal drift and underlies the Seguro outwash, which is inferred to equate with marine oxygen isotope stage 6. The stratigraphical position and age suggest that the tephra post-dates the Poti-Malal glaciation and that it is older than the Seguro drift. The Poti-Malal glaciation must be at least as old as Early-Middle Pleistocene, and the Seguro glaciation is assigned to the penultimate glaciation. The tephra unit may have been deposited during marine oxygen isotope stage 7.

**Journal of Quaternary Science 17[8], 781-788. 2002.**

**P013 - 03 "Giant magnetoimpedance in glass covered amorphous microwires"**

Kraus, L., Frait, Z., Pirota, K. R., and Chiriac, H.

GMI was investigated in amorphous Co-rich glass-covered microwires with very low magnetostriction constant. Internal stresses, induced in the metallic core by the glass coating, substantially reduce the magnitude of GMI. To improve GMI properties magnetoelastic coupling was reduced by a careful choice of alloy composition and by subsequent Joule-heat treatment. The maximum magnetoimpedance, DeltaZ/Z approximate to 600% measured at frequency 15 MHz, is already close to the theoretical value (1060%) and is one of the highest GMI amplitudes ever reported.

**Journal of Magnetism and Magnetic Materials 254, 399-403. 2003.**

**P014 -03 "High-resolution Auger spectroscopy of 4d metals and alloys"**

Kleiman, G. G.

In this paper, we demonstrate the profound relation between the complete screening model and a considerable variety of energy and lineshape data from Auger spectroscopy. Exploitation of the experimental systematics of the LMM Auger parameter of the 4d metals elucidates screening mechanisms as well as the nature of d-band holes and extension of the analysis to the 3d and 5d metals indicates similar results. Application to metallic alloys clarifies and permits extraction of electronic structure information. Double ionization experiments produce quasi-atomic Pd MVV spectra, in agreement with the predictions of the complete screening model and represents the first observation of the clear influence of complete screening on spectral shape.

**Journal of Electron Spectroscopy and Related Phenomena 127[1-2], 53-63. 2002.**

**P015 -03 "Interlayer conduction band states in graphite sulfur composites"**

Kurmaev, E. Z., Galakhov, A. V., Moewes, A., Moehlecke, S., and Kopelevich, Y.

We present experimental evidence for the existence of interlayer states formed in graphite-sulfur (C-S) composites. We have studied occupied and unoccupied p bands of the C-S composites by means of soft x-ray absorption and emission spectroscopy. New spectral features in the C 1s absorption are interpreted as contributions arising from the interaction of sulfur s states with graphite interlayer states. The equivalence of C Kalpha x-ray emission spectra of C-S and graphite lets us conclude that the interlayer states are entirely located above the Fermi level.

**Physical Review B 66[19], 193402. 2002.**

**P016 -03 "Magnetic-field effects in defect-controlled ferromagnetic Ga1- xMnxAs semiconductors"**

dos Santos, R. R., Castro, J. D. E., and Oliveira, L. E.

We have studied the magnetic-field and concentration dependences of the magnetizations of the hole and Mn subsystems in diluted ferromagnetic semiconductor Ga1-xMnxAs. A mean-field approximation to the hole-mediated interaction is used, in which the hole concentration p(x) is parametrized in terms of a fitting (of the hole effective mass and hole/local moment coupling) to experimental data on the T-c critical temperature. The dependence of the magnetizations with x, for a given temperature, presents a sharply peaked structure; with maxima increasing with applied magnetic field, which indicates that application to diluted-magnetic-semiconductor devices would require quality control of the Mn-doping composition. We also compare various experimental data for T-c(x) and p(x) on different Ga1-xMnxAs samples and stress the need of further detailed, experimental work to assure that the experimental measurements are reproducible.

**Journal of Applied Physics 93[3], 1845-1847. 2003.**

**P017 - 03 "Near band-edge optical properties of cubic GaN"**

Fernandez, J. R. L., Noriega, O. C., Soares, J. A. N. T., Cerdeira, F., Meneses, E. A., Leite, J. R., As, D. J., Schikora, D., and Lischka, K.

We used photoluminescence, photoluminescence excitation spectroscopy (PLE) and photoreflectance (PR) to study the optical properties of thin films of cubic GaN, deposited by plasma-assisted molecular beam epitaxy on a GaAs (001) substrate. Our results show a clear step-like absorption edge, resulting from the merging of the free exciton with the continuum. Quantitative values for the absorption-edge energy and lifetime broadening are obtained. The dependence of the latter on temperature, as well as some features of the PR spectrum, reveal that the cubic material still presents residual strain and distortions. A secondary absorption-edge due to hexagonal inclusions is also observed in the PLE spectra.

**Solid State Communications 125[3-4], 205-208. 2003.**

**P018- 03 "Nonclassical effects in cold trapped ions inside a cavity"**

Semiao, F. L., Vidiella-Barranco, A., and Roversi, J. A.

We investigate the dynamics of a cold trapped. ion coupled to the quantized field inside a high-finesse cavity, considering exact resonance between the ionic internal levels and the field (carrier transition). We derive an intensity-dependent Hamiltonian in which terms proportional to the square of the Lamb-Dicke parameter (eta) are retained. We show that different nonclassical effects arise in the dynamics of the ionic population inversion, depending on the initial states of the vibrational motion and field and on the values of eta.

**Physical Review A 66[6], 063403. 2002.**

**P019 -03 "Photoacoustic spectroscopy applied to the study of clay soils"**

dos Santos, D. R., Toledo, R., Massunaga, M. S. O., Carrio, J. G., Auler, L. T., da Silva, E. C.,Garcia-Quiroz, A., and Vargas, H.

The optical absorption spectra and mineralogical composition of soil samples were characterized using photoacoustic spectroscopy and x-ray diffraction. The photoacoustic spectra observed showed transition bands associated with Fe3+ ions in octahedral or tetrahedral symmetry. From the phase behavior, both the nonradiative relaxation time tau and the characteristic thermal diffusion time tau(beta) were determined. The x-ray diffraction analysis showed that kaolinite is a major crystalline phase (86 wt %) followed by minor quantities of anatase, gibbsite, and quartz. Rietveld refinements showed that the Fe3+ cations partially substitute for Al3+ cations in octahedral sites of the kaolinite structure.

**Review of Scientific Instruments 74[1], 355-357. 2003.**

**P020 -02 "Photoacoustics as a tool for the diagnosis of radicular stress: Measurements in eucalyptus seedlings"**

Barja, P. R., Mansanares, A. M., da Silva, E. C., and Alves, P. L. C. A.

In reforesting companies (cellulose industry), eucalyptus is usually cultivated in small plastic containers (50 mL). As seedlings remain for about 120 days in these containers-until transplantation-their roots become space restricted, with consequent limitations in water and nutrient absorption. These restrictions may lead to plant stress, decreasing productivity. In this work, we used the photoacoustic technique to evaluate the photosynthetic activity of Eucalyptus grandis, E. urophylla and E. urograndis seedlings subjected to this limited space availability, seeking a correlation with morphological parameters and fluorescence measurements in these seedlings. Photoacoustic, fluorescence, and morphological analysis were conducted every 15 days, from 45 to 120 days after sowing. Fluorescence and photosynthetic rate were evaluated in vivo and in situ, the latter one using the open photoacoustic technique. Data show that root dry matter diminished markedly at 90 and 120 days after sowing; this behavior showed a high correlation with the gas exchange component of the photoacoustic signal, as well as with the fluorescence ratio Fv/Fm. These results indicate that the soil volume of the container becomes insufficient for the roots after 90 days, probably leading to a nutritional deficiency in plants, which explains the decrease observed in the photosynthetic rate of seedlings.

**Review of Scientific Instruments 74[1], 709-711. 2003.**

**P021 - 03 "Quantitative contactless photothermal monitoring of drying in foodstuff materials"**

Delgadillo-Holtfort, I., Bein, B. K., Pelzl, J., and da Silva, E. C.

In this work a quantitative method for the study of drying in foodstuff systems is presented. This study relies on the fact that changes in moisture content influence the effective thermal transport properties of porous or fibrous materials. Here, we analyze frequency dependent thermal wave signals recorded on the basis of infrared detection at several drying states by considering that the foodstuff system is not perfectly opaque at the surface. The consideration of transparency allows an asymptotic linear analysis that gives direct information about combinations of optical and thermal parameters. This therefore simplifies a further theoretical numerical approach for the signals within the scope of a two- layer model. Under the condition of constant optical properties at the system surface and neglecting the moisture dependence of thermal diffusivity in comparison with changes induced upon the thermal effusivity, the number of effective parameters necessary to follow the drying progress reduces to two: the thermal diffusion time at the drying surface layer and the thermal effusivity of the bulk.

**Review of Scientific Instruments 74[1], 744-746. 2003.**

**P022 - 03 "Renormalization approach to quantum-dot structures under strong alternating fields"**

Schulz, P. A., Rivera, P. H., and Studart, N.

We develop a renormalization method for the quasienergy spectra of low-dimensional structured systems under intense ac fields. These systems are emulated by tight-binding lattice models with a clear continuum limit of the effective-mass and single- particle approximations. The coupling to the ac field is treated nonperturbatively by means of the Floquet Hamiltonian. The renormalization approach gives an intuitive view of the electronic dressed states.

The numerical advantage over a direct diagonalization of the Floquet Hamiltonian makes the method suitable for the study of dressed states of nanoscopic systems with realistic geometries, irrespective of the ac field intensity. Two numerical examples are discussed: a quantum dot, emphasizing the analysis of the effective-mass limit for lattice models and double-dot structures, for which we discuss the limit of the two-level approximation currently used in the literature.

**Physical Review B 66[19], 195310. 2002.**

**P023 - 03 "Reply to 'Comment on Semiclassical approximations in phase space with coherent states'"**

Baranger, M., de Aguiar, M. A. M., Keck, F., Korsch, H. J., and Schellhaass, B.

The Herman-Kluk (HK) formula was shown in (Baranger et al J. Phys. A: Math. Gen. 34 1227) not to be a correct semiclassical limit of an exact quantum mechanical formula. Two previous attempts to derive it using semiclassical arguments contain serious errors. These statements are left totally untouched by Herman and Grossmann's comment. They argue that the formula which we found to be at fault is not the one that should be called the HK formula. However, the formula we criticized is definitely one of the steps, in fact the main step, in these two published derivations of the HK formula. Very recently, a new derivation was published by Miller. It is interesting, but it is not semiclassical.

**Journal of Physics A-Mathematical and General 35[44], 9493-9497. 2002.**

**P024 - 03 "Role of the alloy structure in the magnetic behavior of granular systems"**

Bastos, C. S. M., Bahiana, M., Nunes, W. C., Novak, M. A., Altbir, D., Vargas, P., and Knobel, M.

The effect of grain size, easy magnetization axis, and anisotropy constant distributions in the irreversible magnetic behavior of granular alloys is considered. A simulated granular alloy is used to provide a realistic grain structure for the Monte Carlo simulation of the zero-field-cooled-field-cooled (ZFC-FC) curves. The effect of annealing and external field is also studied. The simulation curves are in good agreement with the FC and ZFC magnetization curves measured on melt spun Cu-Co ribbons.

**Physical Review B 66[21], 214407. 2002.**

**P025 - 03 "Solution studies and structural model of the extracellular domain of the human amyloid precursor protein"**

Gralle, M., Botelho, M. M., de Oliveira, C. L. P., Torriani, I., and Ferreira, S. T.

The amyloid precursor protein (APP) is the precursor of the beta-amyloid peptide (Abeta), which is centrally related to the genesis of Alzheimer's disease (AD). In addition, APP has been suggested to mediate and/or participate in events that lead to neuronal degeneration in AD. Despite the fact that various aspects of the cell biology of APP have been investigated, little information on the structure of this protein is available. In this work, the solution structure of the soluble extracellular domain of APP (sAPP, composing 89% of the amino acid residues of the whole protein) has been investigated through a combination of size-exclusion chromatography, circular dichroism, and synchrotron radiation small-angle x-ray scattering (SAXS) studies. sAPP is monomeric in solution (65 kDa obtained from SAXS measurements) and exhibits an anisometric molecular shape, with a Stokes radius of 39 or 51 Angstrom calculated from SAXS or chromatographic data, respectively. The radius of gyration and the maximum molecular length obtained by SAXS were 38 Angstrom and 130 Angstrom, respectively. Analysis of SAXS data further allowed building a structural model for sAPP in solution. Circular dichroism data and secondary structure predictions based on the amino acid sequence of APP suggested that a significant fraction of APP (30% of the amino acid residues) is not involved in standard secondary structure elements, which may explain the elongated shape of the molecule recovered in our structural model. Possible implications of the structure of APP in ligand binding and molecular recognition events involved in the biological functions of this protein are discussed

**Biophysical Journal 83[6], 3513-3524. 2002.**

**P026 - 03 "Specific heat at low temperatures and magnetic measurements in Nd0.5Sr0.5MnO3 and R0.5Ca0.5MnO3 (R=Nd, Sm, Dy, and Ho) samples"**

Lopez, J., de Lima, O. F., Lisboa, P. N., and Araujo-Moreira, F. M.

We studied the magnetization as a function of temperature and magnetic field in the compounds Nd0.5Sr0.5MnO3, Nd0.5Ca0.5MnO3, Sm0.5Ca0.5MnO3, Dy0.5Ca0.5MnO3, and Ho0.5Ca0.5MnO3. Ferromagnetic, antiferromagnetic, and charge ordering transition in our samples agreed with previous reports. We also did specific-heat measurements with applied magnetic fields between 0 and 9 T and temperatures between 2 and 30 K in all five samples. Below 10 K the specific-heat measurements evidenced a Schottky-like anomaly for all samples. However, we could not successfully fit the curves to either a two level or a distribution of two-level-Schottky anomaly.

**Physical Review B 66[21], 214402. 2002.**

**P027 - 03 "Stability of small carbon-nitride heterofullerenes"**

Schultz, D., Droppa, R., Alvarez, F., and dos Santos, M.C.

Carbon nitride nanostructures have been produced by the arc-discharge technique and analyzed by mass spectrometry. A series of structured peaks in the region of masses from 480 up to 600 suggests the existence of heterofullerenes Cn-xNx(40less than or equal tonless than or equal to50). The structure and stability of these small fullerenes were theoretically investigated by quantum chemical calculations. The obtained heats of formation indicate that C-n molecules stabilize upon nitrogen substitution. Two Cn-xNx cages are quite stable, with heats of formation per atom approaching that of C-60. These molecules could be the seeds of onionlike structures seen in CN materials.

**Physical Review Letters 90[1], 015501. 2003.**

**P028- 03 "Stable TiOx submicrometer channels"**

Scarminio, J., Rigon, E. L., Cescato, L., and Gorenstein, A.

The fabrication of submicrometer, stable channels of radio- frequency sputtered metallic titanium and titanium oxide films with different stoichiometries is described in this work. The structure was obtained by coating the films on structures previously holographically recorded in photoresists on glass substrates, and subsequently dissolving the photoresist. Stable channel structures were obtained for all compositions of the TiOx films. For very thin films (10 nm thick) the structures recorded on TiO2 presented less stability.

**Journal of the Electrochemical Society 150[1], H17-H20. 2003.**

**P029 - 03 "Structure-activity relationship (SAR) studies of the tripos benchmark steroids"**

Vendrame, R., Coluci, V. R., Braga, R. S., and Galvao, D. S.

We report here qualitative structure-activity relationship (SAR) studies for the molecular set called Tripos or Cramer steroid data set. These compounds are known to bind to corticosteroid binding globulin (CBG). In the present work we have used the electronic indices methodology (EIM). The EIM is based on Boolean relational rules exploring the concepts of local density of states and critical values for energy separation involving frontier orbitals. We have also carried out comparative principal component analysis (PCA) and hierarchical clustering analysis (HCA) studies with molecular descriptors obtained from EIM calculations. EIM, PCA and HCA correctly predict (100% accuracy) the steroid's biological activity. The present studies reinforce the universal applicability of the EIM descriptors and show that the combined use of EIM coupled to PCA can be a new efficient and powerful SAR tool.

**Journal of Molecular Structure-Theochem 619[1-3], 195-205. 2002.**

**P030 -03 "Synthesis of polymer films by an electron emission CVD technique"**

Wang, J. J., de Moraes, M. A. B., Landers, R., and Trasferetti, B. C.

A low-pressure chemical vapor deposition (CVD) technique based on the formation of reactive film precursors by dissociation of gas-phase reactants by electron impact is described. The electrons are emitted by a hot filament and a positive bias voltage applied to the substrate provides control of the emission current. The emitted electrons are primarily responsible for the gas dissociation, but secondary electrons resulting from electron-impact ionization of the gas molecules also produce reactive species, contributing to the deposition process. This technique was used to synthesize polymer films from C2H2-N-2 mixtures at pressures ranging from 1-10 Pa. The dependencies of the current collected by the substrate, Is, on the substrate bias voltage, Vs, and on the gas pressure were determined. The film deposition rate was measured as a function of several deposition variables such as I-s, V-S, and the N-2 to C2H2 flow rate ratio. Oxygen was present in the films as a contaminant. Analyses by Fourier transform infrared spectroscopy and X-ray photoelectron spectroscopy (XPS) provided insight into the film molecular structure, allowing identification of various functional groups and binding states of the C- and N-atoms. From the XPS spectra, the N/C and O/C ratios were determined.

**Plasmas and Polymers 7[3], 227-244. 2002.**

**P031 - 03 "The gravitational wave detector "Mario Schenberg": Status of the project"**

Aguiar, O. D., Andrade, L. A., Camargo, L., Costa, C. A., de Araujo, J. C. N., Neto, E. C. D., de Souza, S. T., Fauth, A. C., Frajuca, C., Frossati, G., Furtado, S. R., Furtado, V. G. S., Magalhaes, N. S., Marinho, R. M., Matos, E. S., Meliani, M. T., Melo, J. L., Miranda, O. D., Oliveira, N. F., Ribeiro, K. L., Salles, K. B. M., Stellati, C., and Velloso, W. F.

The first phase of the Brazilian Graviton Project is the construction and operation of the gravitational wave detector Maxio Schenberg at the Physics Institute of the University of Sao Paulo. This gravitational wave spherical antenna is planned to feature a sensitivity better than h = 10-21 Hz-1/2 at the 3.0-3.4 kHz bandwidth, and to work not only as a detector, but also as a testbed for the development of new technologies. Here we present the status of this detector.

**Brazilian Journal of Physics 32[4], 866-868. 2002.**

**P032 - 03 "The use of the U(n,f) reaction dosimetry in the determination of the lambda(f) value through fission track techniques"**

Guedes, S., Hadler, J. C., Iunes, P. J., Zuniga, A., Tello, C. A., and Paulo, S. R.

A new set of determinations of the decay constant for spontaneous fission of U-238, lambda(f), using mica-uranium sandwich and thin films of natural uranium is presented. A value of lambda(f) (8.37+/-0.17) x 10(-17) a(-1) has been determined. The use of uranium-based neutron dosimetry for the measurement of lambda(f) through fission-track techniques is discussed. Particularly, the lambda(f) measurement by Roberts et al. (Phys. Rev. 174 (1968) 4847), is analyzed, showing that the value obtained by these authors (7.03 x 10(-17) a(-1)) underestimated lambda(f). It is concluded that the dosimetry based on U(n,f) reaction does not support lambda(f) value around 7 x 10(-17)a(-1) determined by various authors using mica-uranium sandwich.

**Nuclear Instruments & Methods in Physics Research SectionA-Accelerators Spectrometers Detectors and Associated Equipment 496[1], 215-221, 2003.**

**P033 - 03 "Theoretical and experimental results on Au-NiO and Au-CoO electrochromic composite films"**

Fantini, M. C. A., Ferreira, F. F., and Gorenstein, A.

This paper reports on the theoretical calculations and experimental results on the optical properties, between 400 and 1000 nm, of Au-NiO and Au-CoO composite films. The calculations were based on the Maxwell Garnett effective medium theory, with Au fill factors f varying from 0.0 to 0.05. The results for both media are very similar. The Au configuration in the insulating matrix was modeled to be isolated single spheres (ISS), single linear chain (SLC) and fcc cluster (FCC), as examples of selective absorption in these composite films. Variations in transmission and reflection can be obtained either by thickness variation, as well as from An incorporation, as seen from theoretical and experimental results. Au-NiO films with different reflected colors (blue, green, yellow and orange-red) and same An content were obtained by varying the pressure inside the sputtering deposition chamber. Green colored Au-CoO films with different An content were deposited.

**Solid State Ionics 152, 867-872. 2002.**

**P034 - 03 "Theoretical calculation of the dispersion relation for polymeric thin films: Determination of the thermal diffusivity using photothermal microscopy"**

de Freitas, L. R., Mansanares, A. M., and da Silva, E. C.

Photothermal reflectance microscopy can be used to characterize thin films grown on substrates in two different ways: (a) scanning modulation frequency with both the pump and probe beams coincident and (b) varying the pump-probe beam distance for several modulation frequencies. In the second case, the phase lag behavior, as a function of the beam separation, gives the effective wave number of the thermal wave along the surface. A plot of the wave number versus frequency provides a dispersion relation. Such a relation can be obtained by modeling the thermal problem of the system, and from the experimental data analysis one can determine the thermal parameters of the film and substrate. In the case of films with high thermal diffusivities, it is possible to find an analytical expression for the dispersion relation [A. A. Maznev , J. Appl. Phys. 78, 5266 (1995)]. However, in the case of films with low thermal diffusivities numerical calculation is needed. In this article we present the results of such a calculation for polymer films which have low diffusivities compared to the substrates (glass and silicon). The films were assumed to be opaque to both the pump and probe beams, i.e., both absorption and reflection occur at the film surface. It was observed that at high modulation frequencies the dispersion relation splits into two branches, one characteristic of the film, which is valid for small distances between the pump and probe, and the other characteristic of the substrate, valid for large distances.

**Review of Scientific Instruments 74[1], 735-737. 2003.**

**P035 - 03 "Thermal diffusivity measurements in vegetable oils with thermal lens technique"**

Bernal-Alvarado, J., Mansanares, A. M., da Silva, E. C., and Moreira, S. G. C.

Using a thermal lensing experimental setup the thermal properties of several vegetable oils were obtained. The samples were oils from Amazonian species and olive (the popular identifications are piqui, copaiba, buriti, and babacu). The two lasers mismatched mode experimental configuration was used, with a He-Ne laser as the probe and an Ar+ laser as the excitation one. The time resolved spectra were measured using an automatic system, and fitting the aberrant theoretical model to the data, the characteristic relaxation time were obtained, and knowing this value, the thermal property of each oil was solved.

**Review of Scientific Instruments 74[1], 697-699. 2003.**

**P036 - 03 "Thermal diffusivity anisotropy in calamitic nematic lyotropic liquid crystal"**

Pereira, J. R. D., Palangana, A. J., Bento, A. C., Baesso, M. L., Mansanares, A. M., and da Silva, E.C.

The temperature dependence of the thermal diffusivity, alpha, of a lyotropic liquid crystal is investigated using the thermal lens technique in the range of 12-52 degreesC. The sample under study presents a calamitic-nematic phase between 15.0 and 47.2 degreesC. Below and above these transition temperatures it is in the isotropic phase (the phase below 15.0 degreesC is named reentrant-isotropic, I-RE). The sample is aligned in a magnetic field before measurements, with the micelles parallel or perpendicular to the cuvette sidewalls, thus allowing the determination of the thermal diffusivity in both directions. The observed anisotropy in the thermal transport parameter is analyzed based on a model, which considers the geometry of the micelles and the order parameter S as a function of temperature.

**Review of Scientific Instruments 74[1], 822-824. 2003.**

**P037 - 03 "Thermal expansion coefficient of amorphous carbon nitride thin films deposited by glow discharge"**

Champi, A., Lacerda, R. G., and Marques, F. C.

The thermal expansion coefficient of a-CNx:H thin films was determined by the thermally induced bending technique. The films were deposited by glow discharge under methane and nitrogen atmosphere, and analyzed by FTIR and Raman spectroscopies, nanohardness, and stress measurements. Drastic changes of the film structure were observed as a result of the nitrogen incorporation, from 0 to 7%. The increase of nitrogen concentration reduces the deposition rate, stress, hardness, and the elastic constant of the films. It was also observed that the thermal expansion coefficient has a significant increase from approximately 2-9 x 10(-6)/K, which was associated with the increase in the sp(2) concentration induced by the N incorporation, and with the increase in the concentration of C-N bonds. In spite of that, stable and thick ( similar to 2 mum) films were deposited at moderate deposition rate (0.3 nm/s), relatively high hardness (13 GPa), and low stress (0.6 GPa).

**Thin Solid Films 420, 200-204. 2002.**

**P038 - 03 "Vortex lattice in Bi2Sr2CaCu2O8+delta well above the first- order phase-transition boundary"**

Torres, J. H. S., da Silva, R. R., Moehlecke, S., and Kopelevich, Y.

Measurements of non-local in-plane resistance originating from transverse vortex-vortex correlations have been performed on a Bi2Sr2CaCu2O8+delta high-T-c superconductor in a magnetic field up to 9 T applied along the crystal c-axis. Our results demonstrate that a rigid vortex lattice does exist overa broad portion of the magnetic field-temperature (H-T) phase diagram, well above the first-order transition (FOT) boundary H-FOT(T). The results also provide evidence for the vortex lattice melting and vortex liquid decoupling phase transitions, occurring above the H-FOT(T).

**Solid State Communications 125[1], 11-16. 2003.**

**P039- 03 "X-ray photoelectron spectroscopic study of rare-earth doped amorphous silicon-nitrogen films"**

Zanatta, A. R., Ribeiro, C. T. M., and Alvarez, F.

Amorphous silicon-nitrogen (a-SiN) films independently doped with different rare-earth (RE) elements (Y, La, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu) have been prepared by cosputtering. The films were investigated in detail by x-ray photoelectron spectroscopy employing 1486.6 eV photons. Additional information was also achieved by optical techniques and ion beam analyses. As a result of the deposition method and conditions, the films present similar contents of Si and N, and rare-earth concentrations below 1.0 at. %. In spite of this relatively low concentration, and taking advantage of the high photoionization cross section of the rare-earth elements at 1486.6 eV, the signal of several different core-levels and Auger transitions could be detected and analyzed. The electronic states at the top of the valence band of the RE- doped a-SiN films were also investigated with 1486.6 eV photons. Compared to the spectroscopic data of pure metals, the RE-related core levels of the present a-SiN films exhibit an energy shift typically in the 0.8-2.5 eV range, which is attributed to the presence of nitrogen atoms. According to the experimental data, most of the RE ions remain in the 3+ state. The only clear exception occurs in the Yb-doped a-SiN film, where a large fraction of Yb2+ coexisting with Yb3+ ions is evident.

**Journal of Applied Physics 93[4], 1948-1953. 2003.**


# Abstracta

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