



Abstracta

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E-PRINT

E 001-06 Double Diffraction White Light Imaging: First Results With Bidimensional Diffraction.
E 002- 06 White-Light Imaging In A Two Gratings Diffraction Process

TRABALHO ACEITO PARA PUBLICAÇÃO

A 001-06 Thermo-Statistics of Irreversible Processes: a Boltzmann-Gibbs-Style Ensemble Formalism.

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P 001-06 à P 041-06

E- PRINT

E 001-06 Double Diffraction White Light Imaging: First Results With Bidimensional Diffraction

Lunazzi, J. J.; Rodríguez, N. I. R.

The double diffraction of white light can produce a thin-prism-like image in certain conditions by using ordinary diffraction gratings. The diffractive deviation of rays happens mainly in one direction because the diffracting elements are straight and parallel. We show similar images using elements where diffraction happens in both directions: spiral grooves discs. Some differences between the straight-groove and the almost circular curved-groove cases are described.

Publicado em arXiv, University Cornell Library, ArXiv/physics/0512205 December 22th, 2005

E 002- 06 White-Light Imaging In A Two Gratings Diffraction Process

Lunazzi, J. J.; Rodríguez, N. I. R.

We present an optical process that allows getting the image of an object by purely diffractive ways, without needing any element to intermediate or complement the process. This diffractive optical system is capable to form images integrally using the spectrum of radiation of white light while only using two diffraction gratings.

Publicado em arXiv, University Cornell Library, ArXiv/physics/0506148 June 20th, 2005

TRABALHO ACEITO PARA PUBLICAÇÃO

A 001-06 Thermo-Statistics of Irreversible Processes: a Boltzmann-Gibbs-Style Ensemble Formalism.

Luzzi, R.; Vasconcellos, A. R.; and Ramos, J. G.

The area of physics indicated in the title is nowadays of quite relevant interest, not only from the purely scientific point of view, but specially for its applied aspects associated to the present-time-point-first-technologies. A particular research trend in the theory of irreversible processes, which are evolving in time in systems arbitrarily departed from equilibrium, is here briefly described. It consists in the construction of a Gibbs-style nonequilibrium ensemble formalism. The derivation of a nonequilibrium statistical operator is described (the variational approach of Predictive Statistical Mechanics is used). The main questions involved are presented and applications are briefly mentioned.

Brazilian Journal of Physics 36 [1A], march, 2006.

TRABALHOS PUBLICADOS

P 001 - 06 "A crystalline phase transition and optical properties in (Co-Cu)-Cu-II oxamate-bridged ferrimagnetic chain"

Pereira, C. L. M., Doriguetto, A. C., Konzen, C., Meira-Belo, L. C., Leitao, U. A., Fernandes, N. G., Mascarenhas, Y. P., Ellena, J., Brandl, A. L., Knobel, M., and Stumpf, H. O.

The compound [CoCu(opba)(DMSO)(3)] (1) [opba = orthophenylenebis(oxamato)] has been synthesized and characterized. Its crystal structure has been analyzed by X-ray diffraction techniques at 100 and 298 K. A structural phase-transition has been detected at around 150 K. An orthorhombic crystalline system is found at both temperatures, with very similar unit-cell dimensions. At room temperature it crystallizes in the Pnam space group (alpha-1 phase), with $a = 7.6712(2)$, $b = 14.8003(3)$, $c = 21.0028(5)$ angstrom, and $Z = 4$, whereas at low temperature it crystallizes in the Pna2(1) space group (beta phase), with $a = 7.3530(2)$, $b = 14.5928(4)$, $c = 21.0510(7)$ angstrom, and $Z = 4$. Both crystalline phases consist of linearly ordered bimetallic chains with the [Cu(opba)](2-) units tied by Co-II ions to form a one-dimensional system. The DMSO molecules in a-1, which are coordinated to either Cu-II or Co-II, are disordered. At low temperature, a small reorganization of the Cu-II and CoII environments is observed. The origin of this phase transition, which is completely reversible, is the modification of the crystalline packing with the temperature. Linear birefringence measurements were done on single crystals in the 100-300 K temperature range. Around 150 K, the linear birefringence curve shows an inflexion that is interpreted as being related to the conversion of alpha-1 into beta-1. Both dc and ac magnetic measurements were performed on the polycrystalline sample. The results reveal a one-dimensional ferrimagnetic behavior. Single crystal optical characterization at room temperature shows that 1 presents a very strong dichroism superposed on the linear birefringence.

European Journal of Inorganic Chemistry [24], 5018-5025. 2005.

P 002 - 06 "A theoretical study on elastic electron-CHx (x=1,2,3,4) collisions in the low-energy range"

Lee, M. T., Machado, L. E., Brescansin, L. M., and Iga, I.

In this work, a theoretical study on elastic electron-CHx ($x = 1, 2, 3, 4$) collisions in the low-energy range is presented. More specifically, calculated elastic differential, integral and momentum transfer cross sections are reported in the (0.1-20) eV energy range. An optical potential formed by static, exchange and correlation-polarization contributions is used to represent the electron-target interaction, while the iterative Schwinger variational method is used to solve the scattering equations. Comparison of the calculated results for electron scattering by these targets shows an interesting trend.

Journal of Physics B-Atomic Molecular and Optical Physics 38[21], 3795-3804. 2005.

P 003 - 06 "Additional time-dependent phase in the flavor-conversion formulas"

Bernardini, A. E.

In the framework of intermediate wave-packets for treating flavor oscillations, we quantify the modifications which appear when we assume a strictly peaked momentum distribution and consider the second-order corrections in a power series expansion of the energy. By following a sequence of analytic approximations, we point out that an extra time-dependent phase is merely the residue of second-order corrections. Such phase effects are usually ignored in the relativistic wave-packet treatment, but they do not vanish non-relativistically and can introduce some small modifications to the oscillation pattern even in the ultra-relativistic limit.

Europhysics Letters 73[2], 157-163. 2006.

P 004 - 06 "AIRFLY: Measurement of the air fluorescence radiation induced by electrons"

Arciprete, F., Bohacova, M., Bluemer, J., Bollmann, E., Caruso, R., Di Carlo, P., Doubrava, M., Esposito, A., Facal, P., Fauth, A. C., Goletti, C., Hrabovsky, M., Kemp, E., Klages, H. O., Kleifges, M., Klepser, S., Iarlori, M., Matthiae, G., Mazzitelli, G., Nogima, H., Nozka, L., Palatka, M., Petrera, S., Privitera, P., Proposito, P., Ridky, J., Rizi, V., Salina, G., Schovanek, P., Ulrich, A., Vacek, V., Valente, P., Verzi, V., and Waldenmaier, T.

The AIRFLY (AIR FLuorescence Yield) experiment objective is the precise measurement of the fluorescence yield in atmospheric gases. AIRFLY takes data at the Beam Test Facility of the INFN Laboratori Nazionali di Frascati. A first test performed on the beam line has allowed to verify the feasibility of the physics program which includes an absolute measurement of the fluorescence yield with a precision better than 5%, the measurement of the spectrum and of the yield dependence on the electron energy, gas pressure, temperature and composition. Details of the experimental apparatus and preliminary results from the test are reported.

Nuclear Physics B-Proceedings Supplements 150, 186-189. 2006.

P 005 - 06 "Anti-de sitter curvature radius constrained by quasars in brane-world scenarios"

Coimbra-Araujo, C. H., da Rocha, R., and Pedron, I. T.

This paper is intended to investigate the luminosity due to the accretion of gas in super-massive black holes (SMBHs) in the center of quasars, using a brane-world scenario naturally endowed with extra dimensions, whereon theories formulated introduce corrections in the field equations at high energies. SMBHs possess the necessary highly energetic environment for the introduction of these corrections, which are shown to produce small deviations in all SMBH properties and, consequently, corrections in the accretion theory that supports quasars radiative processes. The radiative flux observed from quasars indicates these deviations, from which the magnitude of the AdS(5) bulk curvature radius, and consequently the extra dimension compactification radius is estimated.

International Journal of Modern Physics D 14[11], 1883-1898. 2005.

P 006 - 06 "Asymmetric impedance in field-annealed Co-based amorphous wires and its bias field dependence"

Duque, J. G. S., De Araujo, A. E. P., and Knobel, A.

Giant magnetoimpedance (GMI) was measured in Joule heated Co₆₈18Fe₄32Si₁₂5B₁₅ amorphous wires. Samples heat treated in open air showed an asymmetric giant magnetoimpedance (AGMI) behaviour. The AGMI profile, measured at selected frequency values and bias circumferential fields, can be related to the exchange bias interaction between the soft magnetic amorphous material and a harder magnetic crystalline phase formed on the surface of the wire. The present data show that AGMI behaviour take place owing to a soft magnetic layer With unidirectional anisotropy that develops in the surface of the wire.

Journal of Magnetism and Magnetic Materials 299[2], 419-424. 2006.

P 007 - 06 "Chaos and pattern formation in a spatial tritrophic food chain"

Maionchi, D. O., dos Reis, S. F., and de Aguiar, M. A. M.

The model of Hastings and Powell describes a tritrophic food chain that exhibits chaotic dynamics. The model assumes that the populations are homogeneously mixed, so that the probability that any two individuals interact is uniform and space can be ignored. In this paper we propose a spatial version of the Hastings and Powell model in which predators seek their preys only in a finite neighborhood of their home location, breaking the mixing hypothesis. Treating both space and time as discrete variables we derive a set of coupled equations that describe the evolution of the populations at each site of the spatial domain. We show that the introduction of local qualitatively distinct dynamics of predator and prey populations. The evolution equations for the predators involve averages over the local density of preys, whereas the equations for the preys involve double averages, where the local density of both preys and predators appear. Our numerical simulations show that local predation also leads to spontaneous pattern formation and to qualitative changes in the global dynamics of the system. predator-prey interactions result in. In particular, depending on the size of the predator neighborhoods, the chaotic strange attractor present in the original model of Hastings and Powell can be replaced by a stable fixed point or by an attractor of simpler topology.

Ecological Modelling 191[2], 291-303. 2006.

P 008 - 06 "Correlated electron-hole transition energies in quantum-well wires: Effects of hydrostatic pressure"

Raigoza, N., Duque, C. A., Porras-Montenegro, N., and Oliveira, L. E.

We perform a theoretical study, using a variational approach, of the effects of hydrostatic pressure on the exciton binding energies and photoluminescence peak positions in GaAs-Ga_{1-x}Al_xAs cylindrical quantum-well wires within the effective-mass approximation. Calculated results suggest that future device applications may be realized by properly varying the wire dimensions and applying hydrostatic pressure.

Physica B-Condensed Matter 371[1], 153-157. 2006.

P 009 - 06 "Cross sections for electron-impact excitation of the H-2 molecule using the MOB-SCI strategy"

da Costa, R. F., da Paixao, F. J., and Lima, M. A. P.

In this paper, we report integral and differential cross sections for the electronic excitation of H-2 molecules by electron-impact. Our scattering amplitudes were calculated using the Schwinger multichannel method within the minimal orbital basis for single configuration interactions (MOB-SCI) level of approximation. Through the use of the present strategy we have investigated the coupling effects among ground state and first singlet and triplet states of the same spatial symmetry. The five-state (nine for degenerated states) close-coupling calculations joined the advantages of a well-described set of physical states of interest with a minimum associated pseudo-state space. The results obtained by means of the MOB-SCI technique show a significant improvement towards experimental data in comparison with previous two-channel close-coupling calculations.

Journal of Physics B-Atomic Molecular and Optical Physics 38[24], 4363-4378. 2005.

P 010 - 06 "D-optimal design of fission-track annealing experiments"

Moreira, P. A. F. P., Guedes, S., Nunes, P. J., and Hadler, J. C.

Fission tracks have been used to estimate time-temperature (t-T) paths of mineral samples of geological interest. Several datasets on annealing rate have been presented, especially for apatite. However, there are still open problems related mainly to chemical composition of apatite and crystallographic orientation of the analyzed crystal sections. Therefore, new annealing data are desirable. However, there are practical limitations (cost and mainly time) on the number of experiments that can be carried out. In this work, a method for optimizing the choice of the experimental conditions of the future experiments is presented, the so-called D-optimal criterion. The D-optimization takes advantage of previous knowledge on the experimental space and the model to be fit, to maximize the information to be obtained from new experiments. It has proved, in other instances, to be suitable for highly non-linear models as the Arrhenius-type equations currently used to fit the fission-track data. A sample example is given, showing that this procedure produces good choices, leading to reliable data fitting.

Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials and Atoms 240[4], 881-887. 2005.

P 011 - 06 "Effect of dipolar interaction observed in iron-based nanoparticles"

Vargas, J. M., Nunes, W. C., Socolovsky, L. M., Knobel, M., and Zanchet, D.

Spherical magnetic nanoparticles with narrow size distribution and organic capping were diluted in paraffin with different concentrations to verify the role of dipolar interactions on the macroscopic magnetic behavior. Increasing concentration of magnetic nanoparticles leads to higher blocking temperatures. The experimental data were analyzed by means of a recently proposed model that takes into account magnetic interactions of dipolar origin, and an excellent agreement was found. Considering the magnetic interaction among particles it was possible to obtain the real magnetic moment and estimate structural parameters that are consistent with the ones obtained by small angle x-ray scattering and transmission electron microscopy.

Physical Review B 72[18]. 2005.

P 012 - 06 "Effective cross-Kerr nonlinearity and robust phase gates with trapped ions"

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

We derive an effective Hamiltonian that describes a cross-Kerr-type interaction in a system involving a two-level trapped ion coupled to the quantized field inside a cavity. We assume a large detuning between the ion and field (dispersive limit) and this results in an interaction Hamiltonian involving the product of the (bosonic) ionic vibrational motion and field number operators. We also demonstrate the feasibility of operation of a phase gate based on our Hamiltonian. The gate is insensitive to spontaneous emission, an important feature for the practical implementation of quantum computing.

Physical Review A 72[6]. 2005.

P 013 - 06 "Electron spin resonance and magnetic characterization of the Gd₅O₉Ge₂O₃Si_{1.88}"

Pires, M. J. M., Carvalho, A. M. G., Gama, S., da Silva, E. C., Coelho, A. A., and Mansanares, A. M.

Electron spin resonance was applied on samples of Gd₅O₉Ge₂O₃Si_{1.88}. The results are discussed under the scope of magnetization measurements, optical metallography, and wavelength dispersive spectroscopy. Polycrystalline arc-melted samples submitted to different heat treatments were investigated. The correlation of the electron spin resonance and magnetization results permitted a characterization of the present phases and their transitions. Two coexisting phases in the temperature range between two phase transitions have been identified and associated to distinct crystallographic phases. Additionally, the magnetic moment at high temperatures has been estimated from the measured effective g factor. A peak value of 21.5 J/kg K for the magnetocaloric effect was obtained for a sample heat treated at 1500 degrees C for 16 h

Physical Review B 72[22]. 2005.

P 014 - 06 "Electronic excitation of CO by positron impact"

da Silva, E. P., Varella, M. T. D., and Lima, M. A. P.

We report calculated cross sections for the electronic excitation of carbon monoxide by positron impact. The calculations were carried out with the Schwinger multichannel method and included six collision channels, namely the ground (X (1)Sigma(+)) and five electronically excited (A (1)Pi, I (1)Sigma(-) and D (1)Delta) states. Present calculated excitation cross sections to the A (1)Pi

state did not present any resonant features, being in this sense consistent with previous calculations for the isoelectronic nitrogen molecule. The experimental a (1)Pi(g) excitation cross section of N-2 presented a resonantlike structure which would also be expected in the A (1)Pi excitation of CO. We discuss possible reasons for the disagreement between experiment and theory.
Physical Review A 72[6]. 2005.

P 015 - 06 "Experimental and numerical investigation of the SBS-threshold increase in an optical fiber by applying strain distributions"

Boggio, J. M. C., Marconi, J. D., and Fragnito, H. L.

We study, experimentally and numerically, the increase of the stimulated Brillouin scattering (SBS) threshold in dispersion-shifted fibers (DSFs) by applying three different tensile-strain distributions. The best results are obtained with a 40-step stair-ramp distribution, for which we demonstrate a 8-dB SBS threshold increase in a 580-m DSF. The Brillouin frequency is observed to shift as a function of the strain at a rate of 0.464 GHz/%. We discuss the potentials and drawbacks of this technique for application in nonlinear devices.

Journal of Lightwave Technology 23[11], 3808-3814. 2005.

P 016 - 06 "Experimental and theoretical elastic cross sections for electron collisions with the C₃H₆ isomers"

Makochekanwa, C., Kato, H., Hoshino, M., Tanaka, H., Kubo, H., Bettega, M. H. F., Lopes, A. R., Lima, M. A. P., and Ferreira, L. G.

In the present work we report cross sections for electron collisions with the isomers propene (C₃H₆) and cyclopropane (c-C₃H₆). Electron-scattering differential cross sections (DCS) are reported for measurements carried out for energies 1.5-100 eV and the angular range of 20 degrees-120 degrees. Elastic integral cross sections (ECS), DCS, and momentum-transfer cross sections (MTCS) are reported for calculations carried out using the Schwinger multichannel method with pseudopotentials for the energy range of 2.0-40 eV and angular range of 0 degrees-180 degrees. The resemblance of the pi(*) shape resonance in the cross sections, observed at 1.5-2.0 eV for propene, to those in C₂H₄ and C₂F₄ clearly points to the effect of the double bond in the molecular structures for these molecules. Below 60 eV, we observed clear differences in peak positions and magnitudes between the DCS, ECS, and MTCS for C₃H₆ and c-C₃H₆, which we view as the isomer effect.

Journal of Chemical Physics 124[2]. 2006.

P 017 - 06 "Growth of nanometric CuGaxOy structures on copper substrates"

Chiaromonte, T., Patriarce, G., Decobert, J., Cardoso, L. P., and Sacilotti, M.

This paper presents an alternative method based on the metal-organic chemical vapour deposition technique to obtain new nanowire structures. Here, the metal-organic precursor acts as a catalyst and interacts with a metallic substrate to produce 3D structures such as nanowires. In the present case, trimethyl gallium interacts with a copper metallic substrate to build a single-crystalline CuGaxOy wire structure. Electronic microscopy techniques on image or diffraction modes have provided the structural and chemical characterization of the obtained nanowires.

Nanotechnology 16[12], 2790-2793. 2005.

P 018 - 06 "In situ photoemission electron spectroscopy study of nitrogen ion implanted AISI-H13 steel"

Zagonel, L. F., Figueroa, C. A., and Alvarez, F.

In this paper we report the effect of hydrogen on the structural properties of AISI-H13 steel nitrogen-implanted samples in low oxygen partial pressure atmosphere. The samples were implanted in a high vacuum chamber by using a broad ion beam source. The H-2(+)/N-2(+) ion composition of the beam was varied and the surface composition studied in situ by photoemission electron spectroscopy (XPS). The samples were also ex situ analyzed by X-ray diffraction and scanning electron microscopy (SEM), including energy-dispersive spectroscopy measurements. It was found that hydrogen has the effect of modifying the amount of retained nitrogen at the surfaces. This result shows that hydrogen plays a role beyond the well-established effect of oxygen etching in industrial machines where vacuum is relatively less well controlled. Finally, an optimum concentration of 20-40% [H-2]/[H-2+N-2] ion beam composition was determined to obtain maximum nitrogen incorporation on the metal surface.

Surface & Coatings Technology 200[7], 2566-2570. 2005.

P 019 - 06 "Influence of synthetic parameters on the size, structure, and stability of dodecanethiol-stabilized silver nanoparticles"

Oliveira, M. M., Ugarte, D., Zanchet, D., and Zarbin, A. J. G. Metal nanoparticles (NP) are very attractive because of their size- and shape-dependent properties. A widely used preparation of ligand-stabilized metal NP is the two-phase liquid-liquid method using dodecanethiol (DT) as ligand. This work presents various procedures to synthesize dodecanethiol-capped silver NPs, all of them based on a two-phase liquid-liquid method. Small alterations in the synthetic parameters lead to dramatic modifications in the nanoparticles' average size, size distribution width, stability, and structure, as well as in their ability to self-assemble.

Journal of Colloid and Interface Science 292[2], 429-435. 2005.

P 020 - 06 "Is it possible to test brane-world scenarios by observation of quasars and microquasars?"

Coimbra-Araujo, C. H., da Rocha, R., and Pedron, I. T.

The aim of this work is to present a possible way to estimate observational electromagnetic clues in the spectrum of quasars and microquasars due to the presence of extra dimensions. Here we analyze two possible ways to detect these electromagnetic signals: by the brane corrected accretion mechanism and by production of electromagnetic KK modes. We show that for the static black hole accretion case, the brane corrections cause a extremely small variation in the luminosity of the quasar. For the electromagnetic KK modes case, apparently the answer for the biggest quasars is positive and on the other hand, the possibility that microquasars can present constraints on extra-dimensional gravity in their spectra is less probable.

Brazilian Journal of Physics 35[4B], 1129-1130. 2005.

P 021 - 06 "Magnetic study of nanocrystalline ferrites and the effect of swift heavy ion irradiation"

Kumar, R., Sharma, S. K., Dogra, A., Kumar, V. V. S., Dolia, S. N., Gupta, A., Knobel, M., and Singh, M.

100 MeV Si⁷⁺ irradiation induced modifications in the structural and magnetic properties of Mg_{0.95}Mn_{0.05}Fe₂O₄ nanoparticles have been studied by using X-ray diffraction, Mossbauer spectroscopy and a SQUID magnetometer. The X-ray diffraction patterns indicate the presence of single-phase cubic spinel structure of the samples. The particle size was estimated from the broadened (311) X-ray diffraction peak using the well-known Scherrer equation. The milling process reduced the average particle size to the nanometer range. After irradiation a slight increase in the particle size was observed. With the room temperature Mossbauer spectroscopy, superparamagnetic relaxation effects were observed in the pristine as well as in the irradiated samples. No appreciable changes were observed in the room temperature Mossbauer spectra after ion irradiation. Mossbauer spectroscopy performed on a 12 h milled pristine sample (6 nm) confirmed the transition to a magnetically ordered state for temperatures less than 140 K. All the samples showed well-defined magnetic ordering at 5 K, whereas, at room temperature they were in a superparamagnetic state. From the magnetization studies performed on the irradiated samples, it was concluded that the saturation magnetization was enhanced. This was explained on the basis of SHI irradiation induced modifications in surface states of the nanoparticles.

Hyperfine Interactions 160[1-4], 143-156. 2005.

P 022 - 06 "Modified branching ratio method for absolute intensity calibration in VUV spectroscopy"

Daltrini, A. M. and Machida, M.

A new modified branching ratio (MBR) method for the absolute intensity calibration of a vacuum ultraviolet (VUV) spectrometer is presented. The spectrometer is equipped with a multichannel detector, consisting of an open microchannel plate coupled to a charge-coupled device (CCD), or with a single channel photomultiplier. This technique extends the number of calibration points available from those provided by the branching ratio (BR) calibration technique. The MBR method is a variation of the conventional BR method, where we relax the condition that the two spectral emissions, in the visible and VUV spectra, come from the same excited level, to include transitions from different sublevels of the same energy level. However, a critical study of the statistical equilibrium of sublevels from the same ion energy level was necessary. As a result, we have more than doubled the number of calibration points for our spectrometer used in tokamak plasma diagnostics. The appropriate identification of new spectral line pairs for absolute calibration here presented opens the path for future works in other devices with similar plasma conditions or impurities content.

IEEE Transactions on Plasma Science 33[6], 1961-1967. 2005.

P 023 - 06 "Nanostructure of granular Co-SiO₂ thin films modified by thermal treatment and its relationship with the giant Hall effect"

Socolovsky, L. M., Oliveira, C. L. P., Denardin, J. C., Knobel, M., and Torriani, I. L.

Granular cosputtered Co-52(SiO₂)₄₈ thin films were thermally treated at different temperatures and their magnetotransport and structural properties were investigated. Hall resistivity increases with annealing temperature (T-a), up to T-a=250 degrees C, and then decreases to a minimum for T-a=400 degrees C. The structural analysis was based on small-angle x-ray scattering results. A model of a polydisperse system of hard spheres was used to retrieve structural parameters. Results reveal that a volume fraction of Co atoms (approximately 25%) are forming nanospheres. The giant Hall effect depends on a particular combination of nanoparticle diameter, size distribution, and interparticle distance.

Physical Review B 72[18]. 2005.

P 024 - 06 "Non-Stueckelberg oscillatory behavior in ion-solid charge transfer"

Pepino, R. T. and Kleiman, G. G.

Reionization of an ion colliding with a solid surface is possible when the atomic level of the ion crosses the Fermi level of the surface. We use a recently reported soluble model to show that a shift of the atomic level above the Fermi level comparable to the surface bandwidth leads to oscillations in the ion survival probability, even when Stueckelberg oscillations are absent. The competing mechanisms responsible for this interesting oscillatory behavior are elucidated and related to a previously unexpected interference between the initially full and empty metallic states

Physical Review A 72[6]. 2005.

P 025 - 06 "On multipolar analytical potentials for galaxies"

Vogt, D. and Letelier, P. S.

We present analytical potential-density pairs in three dimensions for the gravitational field of galaxies, obtained by thickening the multipolar expansion up to the quadrupole term. These may be interpreted as generalizations of the Miyamoto and Nagai potential-density pairs. With a suitable restriction on the possible values of the multipole moments, the density distributions are positive and monotone decreasing functions of the radial and axial coordinates.

Publications of the Astronomical Society of Japan 57[6], 871-875. 2005.

P 026 - 06 "Open photoacoustic cell: Applications in plant photosynthesis studies"

Mesquita, R. C., Mansanares, A. M., da Silva, E. C., Barja, P. R., Miranda, L. C. M., and Vargas, H.

In this article, we review the applications of the open photoacoustic cell (OPC) technique in studies of photosynthetic activity in plant leaves. The ability to perform in vivo and in situ measurements makes this technique particularly suitable for monitoring photosynthesis of plants subjected to specific treatments. Therefore, our objective in the present article is to describe, in more detail, the principles of the OPC technique and to follow the historical path of its applications related to the study of plants and photosynthesis, including recent results. It will be shown that the technique has

been used to observe spectroscopic responses to herbicide application and to soil toxicity, in the study of photosynthesis induction, gas exchange, photochemical loss, photoinhibition, photosynthesis saturation, and photosynthetic responses to changes in parameters such as temperature, atmospheric conditions, and nutrient availability. Recent results have demonstrated its usefulness in the determination of the action spectrum directly from oxygen evolution measurements.

Instrumentation Science & Technology 34[1-2], 33-58. 2006.

P 027 - 06 "Oxygen clamps in gold nanowires"

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

We investigate how the insertion of an oxygen atom in an atomically thin gold nanowire can affect its rupture. We find, using ab initio total energy density functional theory calculations, that O atoms when inserted in gold nanowires form not only stable but also very strong bonds, in such a way that they can extract atoms from a stable tip, serving in this way as a clamp that could be used to pull a string of gold atoms.

Physical Review Letters 96[1]. 2006.

P 028 - 06 "Phase constraint for the waves diffracted by lossless symmetrical gratings at Littrow mount"

Cordeiro, C. M. B., de Carvalho, E. J., Cescato, L., Freschi, A. A., and Li, L. F.

The energy conservation of grating diffraction is analyzed in a particular condition of incidence in which two incident waves reach a symmetrical grating from the two sides of the grating normal at the first-order Littrow mounting. In such a situation the incident waves generate an interference pattern with the same period as the grating. Thus in each direction of diffraction, interference occurs between two consecutive diffractive orders of the symmetrical incident waves. By applying only energy conservation and the geometrical symmetry of the grating profile to this problem it is possible to establish a general constraint for the phases and amplitudes of the diffracted orders of the same incident wave. Experimental and theoretical results are presented confirming the obtained relations.

Journal of the Optical Society of America A-Optics Image Science and Vision 23[1], 166-171. 2006.

P 029 - 06 "Role of magnetic interparticle coupling on the field dependence of the superparamagnetic relaxation time"

Nunes, W. C., Socolovsky, L. M., Denardin, J. C., Cebollada, F., Brandl, A. L., and Knobel, M.

Magnetic properties of Co-SiO₂ granular films are displayed and explained by means of a phenomenological model that takes into account the effects of magnetic interparticle coupling on the superparamagnetic relaxation behavior. The model is based on the analysis of coupled nanoparticles through a modified random anisotropy model that takes into account the concentration and size of the nanoscopic particles, as well as the field dependence of the correlation length. The proposed model leads to an accurate description of the field dependence of the blocking temperature, substantially better than the power law usually employed to describe noninteracting particles.

Physical Review B 72[21]. 2005.

P 030 - 06 "Spontaneous emission and teleportation in cavity QED"

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

In this work, we consider atomic spontaneous emission in a system consisting of two identical two-level atoms interacting dispersively with the quantized electromagnetic field in a high-Q cavity. We investigate the destructive effect of the atomic decay on the generation of maximally entangled states, following the proposal by Zheng S B and Guo G C (2000 Phys. Rev. Lett. 85 2392). In particular, we analyse the fidelity of teleportation performed using such a noisy channel and calculate the maximum spontaneous decay rate we may have in order to realize teleportation.

Journal of Physics B-Atomic Molecular and Optical Physics 38[21], 3875-3884. 2005.

P 031 - 06 "Study of barrier properties and chemical resistance of recycled PET coated with amorphous carbon through a plasma enhanced chemical vapour deposition (PECVD) process"

Cruz, S. A., Zanin, M., Nerin, C., and De Moraes, M. A. B.

Many studies have been carried out in order to make bottle-to-bottle recycling feasible. The problem is that residual contaminants in recycled plastic intended for food packaging could be a risk to public health. One option is to use a layer of virgin material, named functional barrier, which prevents the contaminants migration process. This paper shows the feasibility of using polyethylene terephthalate (PET) recycled for food packaging employing a functional barrier made from hydrogen amorphous carbon film deposited by Plasma Enhanced Chemical Vapour Deposition (PECVD) process. PET samples were deliberately contaminated with a series of surrogates using a FDA protocol. After that, PET samples were coated with approximately 600 and 1200 Angstroms thickness of amorphous carbon film. Then, the migration tests using as food simulants: water, 10% ethanol, 3% acetic acid, and isooctane were applied to the sample in order to check the chemical resistance of the new coated material. After the tests, the liquid extracts were analysed using a solid-phase microextraction device (SPME) coupled to GC-MS.

Food Additives and Contaminants 23[1], 100-106. 2006.

P 032 - 06 "Study of the injection molding of a polarizing beam splitter"

de Carvalho, E. J., Braga, E. D., and Cescato, L. H.

We describe the replication of a relief grating that behaves like a polarizing beam splitter by injection molding. Measurements of the grating master, nickel shim, and replica, performed by atomic force microscopy, allow establishing a limit for the injection molding technique (currently used in CD fabrication) to aspect ratios of approximately 0.15. Although this limit strongly reduces the diffraction efficiency of the elements as well as their polarizing properties, extinction ratios of approximately 10:1 were measured for the replicas in a large range of wavelengths.

Applied Optics 45[1], 100-103. 2006.

P 033 - 06 "Synthesis and characterization of stable room temperature bulk ferromagnetic graphite"

Pardo, H., Faccio, R., Araujo-Moreira, F. M., de Lima, O. F., and Mombru, A. W.

A novel and inexpensive chemical route leading to obtain macroscopic quantities of room temperature magnetic carbon is

reported. This route consists of a controlled etching on the graphite structure, performed by a redox reaction in a closed system between graphite and CuO. X-ray diffraction suggests that this modified graphite could be represented by the coexistence of a matrix of pristine graphite and a foamy-like graphitic structure compressed along the c-axis. This material has a stable and strong ferromagnetic response even at room temperature where it can be attracted by any commercial magnet. At T=300 K, the saturation magnetic moment, the coercive field and the remnant magnetization are 0.25 emu/g, 350 Oe and 0.04 emu/g, respectively.

Carbon 44[3], 565-569. 2006.

P 034 - 06 "The entanglement of two dipole-dipole coupled atoms in a cavity interacting with a thermal field"

Aguiar, L. S., Munhoz, P. P., Vidiella-Barranco, A., and Roversi, J. A.

We investigate the entanglement properties of a system of two dipole-dipole coupled two-level atoms resonantly interacting with a thermal field in a high-Q cavity. We obtain the evolution operator for this system in an analytical form, and use it to evaluate the atom-atom entanglement through the calculation of the negativity. We find that, despite the destructive effect of thermal noise, the dipole interaction yields a considerable amount of entanglement between the two atoms.

Journal of Optics B-Quantum and Semiclassical Optics 7[12], S769-S771. 2005.

P 035 - 06 "The influence of the ion current density on plasma nitriding process"

Ochoa, E. A., Figueroa, C. A., and Alvarez, F.

In this paper, we report a comprehensive nitriding study carried out using low-alloy steel AISI 4140, combining nitrogen ion-beam (IB) implantation and pulsed plasma (PP) nitriding. Quantitative relationships among hardness, nitrogen bulk profile concentration, and current ion densities are reported. The hardness profile showed a linear relationship with the nitrogen concentration. The samples were characterized by photoemission electron spectroscopy (XPS), X-rays diffraction analysis (XRD), scanning electron microscopy (SEM) and in-depth nanohardness measurements. Samples treated by ion-beam-implantation showed the presence of a compound layer formed principally by epsilon-Fe₃N and gamma'-Fe₄N. On the other hand, samples treated by pulsed plasma nitriding showed only the existence of gamma'-Fe₄N. In the later set of samples, was possible to prove that hardness is proportional to the ion current density.

Surface & Coatings Technology 200[7], 2165-2169. 2005.

P 036 - 06 "The super-Poincare algebra via pure spinors and the interaction principle in 3D Euclidean space"

da Rocha, R.

The Poincare superalgebra is introduced from a generalization of the Cartan's triality principle based on the extension of Chevalley product, between semispinor spaces and even subspaces of the extended exterior algebra over Euclidean space R-3. The pure spinor formalism and the framework of Clifford algebras are used, in order to provide the necessary tools to introduce the Poincare superalgebra where all the operators in space and superspace are constructed via pure spinors in R³ and the interaction principle, that generalizes the SO(8) triality principle.

Brazilian Journal of Physics 35[4B], 1138-1139. 2005.

P 037 - 06 "Theoretical prediction of ferromagnetic MnN layers embedded in wurtzite GaN"

Marques, M., Scolfaro, L. M. R., Teles, L. K., Furthmuller, J., Bechstedt, F., and Ferreira, L. G.

We studied, using the spin density functional theory, the manganese mononitride (MnN) grown on GaN in the wurtzite phase, forming the GaN/MnN heterostructures. We obtained a ferromagnetic ground state with a higher magnetic moment than the hypothetical wurtzite bulk MnN. This behavior can be explained in terms of the high magnetization of the MnN interface monolayers that have longer first and second neighbors bond lengths due to structure relaxation. We suggest that this system can be applied to the new spintronics technology by being able to provide spin polarized carriers in the important wide-gap nitride systems.

Applied Physics Letters 88[2]. 2006.

P 038 - 06 "Two-photon cooling of magnesium atoms"

Malossi, N., Damkjaer, S., Hansen, P. L., Jacobsen, L. B., Kindt, L., Sauge, S., Thomsen, J. W., Cruz, F. C., Allegrini, M., and Arimondo, E.

A two-photon mechanism for cooling atoms below the Doppler temperature is analyzed. We consider the magnesium ladder system $(3s(2))S-1(0) \rightarrow (3s3p)P-1(1)$ at 285.2 nm followed by the $(3s3p)P-1(1) \rightarrow (3s3d)D-1(2)$ transition at 880.7 nm. For the ladder system quantum coherence effects may become important. Combined with the basic two-level Doppler cooling process this allows for reduction of the atomic sample temperature by more than a factor of 10 over a broad frequency range. First experimental evidence for the two-photon cooling process is presented and compared to model calculations. Agreement between theory and experiment is excellent. In addition, by properly choosing the Rabi frequencies of the two optical transitions a velocity independent atomic dark state is observed.

Physical Review A 72[5]. 2005.

P 039 - 06 "Ultrashort pulse propagation in multilevel systems"

de Araujo, L. E. E.

Here, I discuss the propagation of an ultrashort pulse through a collection of harmonic multilevel systems. In the limit of weak excitation and a large number of excited states, I show that the amplitude of the input driving pulse decays exponentially with propagation distance. The absorption coefficient associated with this decay is determined by the characteristic time of the manifold of excited states, instead of the polarization decay time as in the conventional absorption coefficient of a two-level atom. The input ultrashort pulse creates in the excited states a wave packet, which oscillates emitting secondary pulses in the process. Analytic solutions are obtained that describe the propagation of individual wave-packet re-emission pulses, and it is shown that their phase depends on the detuning of the input pulse.

Physical Review A 72[5]. 2005.

P 040 - 06 "Variation in the luminosity of Kerr quasars due to an extra dimension in the brane Randall-Sundrum model"

da Rocha, R. and Coimbra-Araujo, C. H.

We propose an alternative theoretical approach showing how the existence of an extra dimension in the Randall-Sundrum model can be used to estimate the correction in the horizon of Schwarzschild and Kerr black holes, and consequently its measurability in terms of the variation of quasar luminosity, which can be caused by an imprint of an extra dimension endowing the geometry of the brane-world scenario to the AdS(5) bulk. The rotation effects cause a more prominent correction in Kerr horizon radii than in the Schwarzschild (static black hole) radius, via brane-world effects, and the consequent bigger variation in the luminosity in Kerr black hole quasars. This paper is intended to investigate the variation of luminosity due to the accretion of gas in Schwarzschild and Kerr black holes (BHs) in the centres of quasars, besides also investigating the variation of luminosity in supermassive BHs arising from brane-world effects, using the Randall-Sundrum model.

Journal of Cosmology and Astroparticle Physics [12]. 2005.

P 041 - 06 "X-ray powder diffraction beamline at D10B of LNLS: application to the Ba₂FeReO₆ double perovskite"

Ferreira, F. F., Granado, E., Carvalho, W., Kycia, S. W., Bruno, D., and Droppa, R.

A new beamline, fully dedicated to X-ray powder diffraction (XPD) measurements, has been installed after the exit port B of the bending magnet D10 at the Brazilian Synchrotron Light Laboratory (LNLS) and commissioned. The technical characteristics of the beamline are described and some performance indicators are listed, such as the incoming photon flux and the angular/energy resolutions obtainable under typical experimental conditions. The results of a Rietveld refinement for a standard sample of Y₂O₃ using high-resolution data are shown. The refined parameters match those found in the literature, within experimental error. High-resolution XPD measurements on Ba₂FeReO₆ demonstrate a slight departure from the ideal cubic double-perovskite structure at low temperatures, not detected by previous powder diffraction experiments. The onset of the structural transition coincides with the ferrimagnetic ordering temperature, T(c) similar or equal to 315 K. Subtle structural features, such as those reported here for Ba₂FeReO₆, as well as the determination and/or refinement of complex crystal structures in polycrystalline samples are ideal candidate problems to be investigated on this beamline.

Journal of Synchrotron Radiation 13, 46-53. 2006.

Abstracta

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