

Abstracta

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Trabalhos Aceitos para Publicação

A001-09 à A003 -09

Trabalhos Publicados

Março 2009 à Abril 2009

P049-09 à P094 -09

Trabalhos Aceitos para Publicação

A001-09 “LA NUBE’: A Maneira mais emocionante de se experimentar espelhos planos”

José J. Lunazzi

The experience of employing a plane mirror located at the height of the nose of an observer, giving a new dimension to the experiences made with simple mirrors, is used as an example into the discussion of what can be done for the student to reach a deeper and conceptual insight in learning physics. The main idea lay on the mental independence, which includes that new results can result through the analysis of experiments which not necessarily needs to be made with new elements or through a sophisticated procedure.

Revista Brasileira de Ensino de Física 26[2]. 416-425. 2009

A002-09 “El holograma y su utilización como un medio de enseñanza de la física en ingeniería”

R. Serra, G. Vega, A Ferrat, J. Lunazzi, D. Magalhães

El proceso de perfeccionamiento de la Educación Superior Cubana y en particular de la Disciplina Física en las carreras de Ingeniería, unido a la gran revolución en la educación que se desarrolla en la actualidad en nuestro país que incluye la batalla por la formación de una cultura general integral en toda nuestra población, requiere la utilización de nuevos medios de enseñanza y de educación social que utilizados tanto curricular como socialmente contribuyan a este propósito. Este trabajo es el resultado de la investigación que se ha desarrollado desde 1990 y que concluyó con la defensa de una tesis doctoral, teniendo como objetivo principal realizar una propuesta pedagógica de utilización de los hologramas como medio de enseñanza de la Disciplina Física en Ingeniería y como medio de educación social en Museología a través del vínculo Investigación - Docencia - Extensión Universitaria, de modo que contribuyan a la formación de una cultura general integral en los estudiantes y en la población que a ellos tienen acceso. Entre los principales resultados novedosos del trabajo podemos citar los siguientes: - Fundamentación pedagógica, psicológica y sociológica de la utilización del holograma como un medio de enseñanza y de educación social. - Demostración de la factibilidad de utilización del holograma como un medio de enseñanza y de educación social en Cuba a través del vínculo entre los tres procesos universitarios de Investigación, Docencia y Extensión Universitaria, considerándolos como un único proceso integrado dirigido a la solución de necesidades sociales. - Concepción y desarrollo de un Proyecto Comunitario de alcance nacional sobre Exposiciones Holográficas itinerantes en la comunidad como contribución a la formación de una cultura general integral masiva con igualdad de derechos y de oportunidades.

Revista Brasileira de Ensino de Física 31[1], 2009

A003-09 “Fazendo imagens com um simples elemento difrativo ou refrativo: o axicon”

J. J. Lunazzi; D. S. F. Magalhães

In this previously divulgated paper¹ we demonstrate that the light diffracted by a simple compact disc can be used to generate images with interesting basic attributes. We compare this attributes with the ones obtained with refractive elements. A compact disc is an axicon that generates a diffraction-free beam and we have shown that the focused position of the image depends on the wavelength of the diffracted light, thus it can be useful as a spectral filter. The experiments are of easy reproduction, allowing the understanding of images that the students observe daily at school or at home.

Revista Brasileira de Ensino de Física 31[2]. 2501, 2009

Trabalhos Publicados

P049-09 “A conjugate for the Bargmann representation”

Ribeiro, A. D., Parisio, F., and de Aguiar, M. A. M.

In the Bargmann representation of quantum mechanics, physical states are mapped into entire functions of a complex variable z^* , whereas the creation and annihilation operators (a) over cap (dagger) and (a) over cap a play the role of multiplication and differentiation with respect to z^* , respectively. In this paper we propose an alternative representation of quantum states, conjugate to the Bargmann representation, where the roles of (a) over cap (dagger) and (a) over cap a are reversed, much like the roles of the position and momentum operators in their respective representations. We derive expressions for the inner product that maintain the usual notion of distance between states in the Hilbert space. Applications to simple systems and to the calculation of semiclassical propagators are presented

Journal of Physics A-Mathematical and Theoretical 42[10]. 105301. 2009.

P050-09 “Absolute Neutrino Mass from Helicity Measurements”

Nishi, C. C.

The possibility to access the absolute neutrino mass scale through the measurement of the wrong helicity contribution of charged leptons is investigated in pion decay. Through this method, one may have access to the same effective mass $m(\beta)$ (2) extractable from the tritium beta decay experiments for electron neutrinos as well as the analogous effective mass $(m(\nu_\mu)/2)^{\text{eff}}$ for muon neutrinos. In the channel $\pi^- \rightarrow e^-(\nu)$ over bar, the relative probability of producing an antineutrino with left helicity is enhanced if compared with the naive expectation $(m(\nu)/2E(\nu))^2$. The possibility to constrain new interactions in the context of two-Higgs-Doublet models is also investigated

Modern Physics Letters A 24[3], 219-227. 2009.

P051-09 “All-fiber devices based on photonic crystal fibers with integrated electrodes”

Chesini, G., Cordeiro, C. M. B., de Matos, C. J. S., Fokine, M., Carvalho, I. C. S., and Knight, J. C.

A special kind of microstructured optical fiber is proposed and fabricated in which, in addition to the holey region (solid core and silica-air cladding), two large holes exist for electrode insertion. Either Bi-Sn or Au-Sn alloys were selectively inserted into the large holes forming two parallel, continuous and homogeneous internal electrodes. We demonstrate the production of a monolithic device and its use to externally control some of the guidance properties (e. g. polarization) of the fiber. (C) 2009 Optical Society of America

Optics Express 17[3], 1660-1665. 2009.

P052-09 “An improved procedure for fringe-locked photorefractive running hologram data processing”

Salazar, A., Lorduy, G. H., Montenegro, R., and Frejlich, J.

We report a new improved procedure for experimental data fitting in photorefractive fringe-locked running hologram experiments. From this fitting we compute the diffusion length $L-D$, the Debye screening length $l(s)$, and the quantum efficiency for photo-excitation of charge carriers Φ , with a lower degree of uncertainty than reported in previous publications. The procedure was successfully tried on an undoped B12TiO20 (BTO) crystal and led to $L-D = 0.16 \mu\text{m}$, $l(s) = 0.038 \mu\text{m}$, and $\Phi = 0.33$, in good agreement with the already available information on this sample. The effectively applied electric field coefficient in the experiment was also estimated

Journal of Optics A-Pure and Applied Optics 11[4]. 045201. 2009.

P053-09 “Beam-energy and system-size dependence of dynamical net charge fluctuations”

Abelev, B. I., Aggarwal, M. M., Ahammed, Z., Anderson, B. D., Arkhipkin, D., Averichev, G. S., Bai, Y., et al

We present measurements of net charge fluctuations in Au+Au collisions at $\sqrt{s(\text{NN})}=19.6, 62.4, 130, \text{ and } 200 \text{ GeV}$, Cu+Cu collisions at $\sqrt{s(\text{NN})}=62.4 \text{ and } 200 \text{ GeV}$, and p+p collisions at $\sqrt{s}=200 \text{ GeV}$ using the dynamical net charge fluctuations measure $\nu(+,-,\text{dyn})$. We observe that the dynamical fluctuations are nonzero at all energies and exhibit a modest dependence on beam energy. A weak system size dependence is also observed. We examine the collision centrality dependence of the net charge fluctuations and find that dynamical net charge fluctuations violate $1/N$ -ch scaling but display approximate $1/N$ -part scaling. We also study the azimuthal and rapidity dependence of the net charge correlation strength and observe strong dependence on the azimuthal angular range and pseudorapidity widths integrated to measure the correlation

Physical Review C 79[2]. 024906. 2009.

P054-09 “Cathodoluminescence and structural studies of nitrided 3D gallium structures grown by MOCVD”

Chiaromonte, T., Romero, M. J., Fabreguette, F., Cardoso, L. P., and Sacilotti, M.

Cathodoluminescence (CL) spectrum imaging and grazing incidence X-ray diffraction (GIXRD) are employed to investigate nitride three-dimensional (3D) gallium structures. The metallic precursors are naturally obtained on a large variety of substrates by metal-organic chemical vapor deposition (CVD) with different shape/size controlled by the growth conditions, especially the temperature. These 3D metallic structures are subsequently exposed to a nitridation process in a conventional CVD reactor to form GaN nanocrystals, as confirmed by GIXRD measurements. CL spectroscopy shows visible light emission (2.5-2.8 eV) excited from the GaN in the 3D structures.

Journal of Luminescence 129[3], 176-180. 2009.

P055-09 “Complex magnetic internal order in structurally disordered Ni nanoparticles”

De Biasi, E., Leon-Vanegas, A., Nunes, W. C., Sharma, S. K., Haddad, P., Rocha, T. C. R., Santos Duque, J. G., Zanchet, D., and Knobel, M.

A detailed study of the magnetic properties of colloidal Ni nanoparticles (similar to 5.2 nm) that do not present long range order is presented. Two magnetic contributions were observed at high temperatures ($> 25 \text{ K}$), a dominating paramagnetic one and a ferromagnetic contribution, detected by ferromagnetic resonance and low field magnetic measurements. Interestingly, the ferromagnetic behavior does not follow a classical superparamagnetic description. The effective anisotropy increases at low temperatures due to interactions among the ferromagnetic clusters, which leads the system to a frustrated state

European Physical Journal B 66[4], 503-508. 2008.

P056-09 “Consequences of a generalized law of the lever”

Assis, A. K. T. and Ravanelli, F. M. D. M.

We discuss the controversy about the demonstration of the law of the lever as given by Archimedes. One aspect of the discussion concentrates on the meaning of the postulates which he utilized. We analyze what consequences would arise if nature behaved in such a way that the lever followed a generalized power law. In particular, we consider the cases of a torque independent of the distances of the bodies to the fulcrum, proportional to these distances, and quadratic in the distances

American Journal of Physics 77[1], 54-58. 2009.

P057-09 “Dirac Fermions in graphite: The state of art”

Luk'yanchuk, I. A., Kopelevich, Y., and El Marssi, M.

Macroscopic concentration of massless charge carriers with linear conic spectrum-Dirac Fermions (DF)-was shown in 2004 to exist in highly oriented pyrolytic graphite (HOPG) and governs its electronic properties. These carriers can have the same nature as DF observed in graphite monolayer (graphene) and let to view HOPG as superposition of 2D carbon layers, almost independent electronically. We overview here the recent experimental evidences of 2D DF in graphite and their similarity with carriers in graphene.

Physica B-Condensed Matter 404[3-4], 404-406. 2009.

P058-09 “Dissipative dynamics of a two-level system resonantly coupled to a harmonic mode”

Brito, F. and Caldeira, A. O.

We propose an approximation scheme to describe the dynamics of the spin-boson model when the spectral density of the environment shows a peak at a characteristic frequency Ω which can be very close (or even equal) to the spin Zeeman frequency Δ . Mapping the problem onto a two-state system (TSS) coupled to a harmonic oscillator (HO) with frequency $\omega(0)$, we show that the representation of displaced HO states provides an appropriate basis to truncate the Hilbert space of the TSS-HO system and therefore a better picture of the system dynamics. We derive an effective Hamiltonian for the TSS-HO system, and show it furnishes a very good approximation for the system dynamics even when its two subsystems are moderately coupled. Finally, assuming the regime of weak HO-bath coupling and low temperatures, we are able to analytically evaluate the dissipative TSS dynamics

New Journal of Physics 10. 115014 2008.

P059-09 “Effects of hydrostatic pressure on the conduction-electron g-factor in GaAs-Ga_{1-x}Al_xAs quantum wells”

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

The effects of hydrostatic pressure on the conduction-electron effective Lande g-factor in semiconductor GaAs-Ga_{1-x}Al_xAs quantum wells under growth-direction and in-plane magnetic fields are studied. Calculations are performed by using the Ogg-McCombe effective Hamiltonian in order to take into account the non-parabolicity and anisotropy of the conduction band. Numerical results are obtained as functions of the applied hydrostatic pressure and magnetic fields. Present results are in quite good agreement with experimental measurements in GaAs-Ga_{1-x}Al_xAs quantum wells in the absence of hydrostatic pressure, and indicate new possibilities for manipulating the electron-effective g-factor in semiconductor low-dimensional systems.

Physica Status Solidi B-Basic Solid State Physics 246[3], 648-651. 2009.

P060-09 “Elastic scattering of slow electrons by n-propanol and n-butanol”

Khakoo, M. A., Muse, J., Silva, H., Lopes, M. C. A., Winstead, C., Mckoy, V., de Oliveira, E. M., da Costa, R. F., Varella, M. T. D., Bettega, M. H. F., and Lima, M. A. P.

We report measured and calculated cross sections for elastic scattering of low-energy electrons by the alcohols n-propanol and n-butanol in the gas phase. The measurements were carried out using the relative-flow method with an aperture source rather than a conventional tube or capillary-array source, eliminating the need to know molecular diameters. The calculations employed two different implementations of the Schwinger multichannel variational method and included polarization effects. The differential cross sections are dominated by strong forward scattering due to the molecules' large electric dipole moments, but near 10 eV, they display structure at intermediate angles that is probably associated with shape resonances, notably a pronounced f-wave scattering pattern. Overall agreement between the measured and calculated results is fair. We compare the cross sections of these larger alcohols to those of methanol and ethanol, as well as to those of alkanes

Physical Review A 78[6]. 062714. 2008.

P061-09 “Excitons in coupled quantum dots: hydrostatic pressure and electric field effects”

Lopez, S. Y., Porras-Montenegro, N., and Duque, C. A.

The variational procedure, in the effective-mass and parabolic-band approximations, is used in order to investigate the effects of hydrostatic pressure and in-growth direction applied electric field on the exciton states in vertically GaAs-Ga_{1-x}Al_xAs coupled quantum dots. We have found that when the symmetrical lengths and radius of each QD are comparable with the Bohr radius of the GaAs material and for a finite value of the applied electric field, the binding energy always diminishes with the length of the central barrier because the two carriers in the exciton are localized in two well defined different regions of the system. However, for the zero electric field the binding energy decreases with the barrier width from the limit value corresponding to the exciton confined in one quantum dot of volume V up to reach a minimum and then increases to a value which corresponds to that of the exciton confined in an isolated quantum dot of volume V/2. Additionally, we have found that the applied electric field can induce that the lowest structure in the photoluminescence-peak energy transitions be associated to spatially indirect excitons, situation which in the zero limit of the electric field and independent of the dimensions of the two coupled dots, always corresponds to spatially direct excitons. The main hydrostatic pressure effect reveals an increasing in the exciton binding energy, without modifying the direct or indirect exciton regime,

and a well defined rigid blue-shift in the photoluminescence peak energy transitions in the presence of an applied electric field.

Physica Status Solidi B-Basic Solid State Physics 246[3], 630-634. 2009.

P062-09 “First-principles modeling of lattice defects: advancing our insight into the structure-properties relationship of ice”

de Koning, M.

We discuss a number of examples that demonstrate the value of computational modeling as a complementary approach in the physics and chemistry of ice I-h, where real-life experiments often do not give direct access to the desired information or whose interpretation typically requires uncontrollable assumptions. Specifically, we discuss two cases in which, guided by experimental insight, density-functional-theory-based first-principles methods are applied to study the properties of lattice defects and their relationship to ice I(h)s macroscopic behavior. First, we address a question involving molecular point defects, examining the energetics of formation of the molecular vacancy and a number of different molecular interstitial configurations. The results indicate that, as suggested by earlier experiments, a configuration involving bonding to the surrounding hydrogen-bond network is the preferred interstitial structure in ice I-h. The second example involves the application of modeling to elucidate on the microscopic origin of the experimental observation that a specific type of ice defect is effectively immobile while others are not. Inspired by previous suggestions that this defect type may be held trapped at other defect sites and our finding that the bound configuration is the preferred interstitial configuration in ice I-h, we use first-principles modeling to examine the binding energetics of the specific ice defect to the molecular vacancy and interstitial. The results suggest a preferential binding of the immobile defect to the molecular interstitial, possibly explaining its experimentally observed inactivity

Scientific Modeling and Simulations 15[1-3], 123-141. 2008.

P063-09 “Fundamentación del holograma como un medio de enseñanza de la Física”

R. L. Serra, G. Vega, A. Ferrat, J. J. Lunazzi, D. S. F. Magalhães

With the emergence of the holograms viewed with white light and its later development, two possibilities were opened for its utilization as teaching medium by the characteristic of producing a three-dimensional image that constitutes an optical duplicate of an object. In the work the distinctive characteristics of the hologram are described as a Physics teaching medium and was realized the pedagogic, sociological and psychological foundation of its utilization by these purposes.

Latin American Journal Physics Education 2[3], 294-302, 2008

P064-09 “High refrigerant capacity of PrNi_{5-x}Co_x magnetic compounds exploiting its spin reorientation and magnetic transition over a wide temperature zone”

Rocco, D. L., Amaral, J. S., Leitao, J. V., Amaral, V. S., Reis, M. S., Das, S., Fernandes, R. P., Araujo, J. P., Pereira, A. M., Tavares, P. B., Martins, N. V., and Coelho, A. A.

The ferromagnetically coupled cobalt ion is observed to create a magnetocrystalline anisotropy in the PrNi_{5-x}Co_x structure above a critical composition of $x = 2$. The competition of the anisotropy energies between Co and Pr sublattices gives rise to a spin reorientation (SR) phenomenon in PrNi_{5-x}Co_x compounds at a low temperature (similar to 150 K) which is then followed by a magnetic transition at a higher temperature.

Co-doping has a strong influence on the Curie temperature, changing it from similar to 60K ($x = 1.95$) to similar to 537K ($x = 3$). The magnetic entropy change is associated with SR as well as a magnetic transition, and correspondingly a large full width at half maximum (ΔT -FWHM) is obtained for this series of compounds. For example, the $\text{PrNi}_{2.85}\text{Co}_{2.15}$ compound presents ΔT -FWHM = 166K at a 1 T field. This series therefore has an appreciable relative cooling power, which makes this material a suitable magnetic refrigerant over a large temperature span

Journal of Physics D-Applied Physics 42[5]. 055002. 2009.

P065-09 "Holo-television system with a single plane"

Lunazzi, J. J., Magalhaes, D. S. E., Rivera, N. I. R., and Serra, R. L.

We show a system capable of projecting a video scene onto a white-light holographic screen to obtain a kind of image that results in a plane in front of the screen. This holographic screen is mainly a diffractive lens and is constructed by holography. The image plane can be located at any azimuth angle and seen with continuous parallax and without the use of goggles or any special visualization equipment. The image is not volumetric, but when the plane is oblique to the observer its appearance looks very close to a real volumetric image.

Optics Letters 34[4], 533-535. 2009.

P066-09 "Hybrid reflections in $\text{InGaP}/\text{GaAs}(001)$ by synchrotron radiation multiple diffraction"

de Menezes, A. S., dos Santos, A. O., Almeida, J. M. A., Bortoleto, J. R. R., Cotta, M. A., Morelhaio, S. L., and Cardoso, L. P.

Hybrid reflections (HRs) involving substrate and layer planes (SL type) [Morelhaio et al., Appl. Phys. Lett. 73 (15), 2194 (1998)] observed in Chemical Beam Epitaxy (CBE) grown $\text{InGaP}/\text{GaAs}(001)$ structures were used as a three-dimensional probe to analyze structural properties of epitaxial layers. A set of (002) rocking curves (ω -scan) measured for each 15 degrees in the azimuthal plane was arranged in a pole diagram in ϕ for two samples with different layer thicknesses (#A - 58 nm and #B - 370 nm) and this allowed us to infer the azimuthal epilayer homogeneity in both samples. Also, it was shown the occurrence of (1 1) over $\bar{3}$ HR detected even in the thinner layer sample. Mappings of the HR diffraction condition ($\omega:\phi$) allowed to observe the crystal truncation rod through the elongation of HR shape along the substrate secondary reflection streak which can indicate in-plane match of layer/substrate lattice parameters.

Physica Status Solidi B-Basic Solid State Physics 246[3], 544-547. 2009.

P067-09 "Hydrogen from Biomass Gas Steam Reforming for Low Temperature Fuel Cell: Energy and Exergy Analysis"

Sordi, A., Silva, E. P., Milanez, L. F., Lobkov, D. D., and Souza, S. N. M.

This work presents a method to analyze hydrogen production by biomass gasification, as well as electric power generation in small scale fuel cells. The proposed methodology is the thermodynamic modeling of a reaction system for the conversion of methane and carbon monoxide (steam reforming), as well as the energy balance of gaseous flow purification in PSA (Pressure Swing Adsorption) is used with eight types of gasification gases in this study.

The electric power is generated by electrochemical hydrogen conversion in fuel cell type PEMFC (Proton Exchange Membrane Fuel Cell). Energy and exergy analyses are applied to evaluate the performance of the system model. The simulation demonstrates that hydrogen production varies with the operation temperature of the reforming reactor and with the composition of the gas mixture. The maximum H₂ mole fraction (0.6-0.64 mol.mol⁻¹) and exergetic efficiency of 91-92.5% for the reforming reactor are achieved when gas mixtures of higher quality such as: GGAS₂, GGAS₄ and GGAS₅ are used. The use of those gas mixtures for electric power generation results in lower irreversibility and higher exergetic efficiency of 30-30.5%

Brazilian Journal of Chemical Engineering 26[1], 159-169. 2009.

P068-09 "Hydrostatic pressure, electric and magnetic field effects on shallow donor impurity states and photoionization cross section in cylindrical $\text{GaAs-Ga}_{1-x}\text{Al}_x\text{As}$ quantum dots"

Barseghyan, M. G., Kirakosyan, A. A., and Duque, C. A.

Using the variational method and the effective mass approximation, we have calculated the influence of applied electric and magnetic fields, both in the axial direction, and hydrostatic pressure on the binding energy and photoionization cross section for on center shallow-donor impurities in cylindrical shaped $\text{GaAs-Ga}_{1-x}\text{Al}_x\text{As}$ quantum dots. For the hydrostatic pressure effects the Gamma-X crossover has been taken into account. Different values for the structure dimensions, applied electric and magnetic fields, hydrostatic pressure, and energy of the incident photon have been considered. Because the parallel polarization of the incident radiation has been considered, the main effects on the photoionization cross section are associated with the applied electric field.

Physica Status Solidi B-Basic Solid State Physics 246[3], 626-629. 2009.

P069-09 "Indications of Conical Emission of Charged Hadrons at the BNL Relativistic Heavy Ion Collider"

Abelev, B. I., Aggarwal, M. M., Ahammed, Z., Anderson, B. D., Arkhipkin, D., Averichev, G. S., et al

Three-particle azimuthal correlation measurements with a high transverse momentum trigger particle are reported for pp, d + Au, and Au + Au collisions at $\sqrt{s_{NN}} = 200$ GeV by the STAR experiment. Dijet structures are observed in pp, d + Au and peripheral Au + Au collisions. An additional structure is observed in central Au + Au data, signaling conical emission of correlated charged hadrons. The conical emission angle is found to be $\theta = 1.37 \pm 0.02(\text{stat}) \pm 0.06(\text{syst})$, independent of p perpendicular to

Physical Review Letters 102[5]. 052302. 2009.

P070-09 "Influence of microstructure on the corrosion behavior of nitrocarburized AISI H13 tool steel obtained by pulsed DC plasma"

Basso, R. L. O., Candal, R. J., Figueroa, C. A., Wisnivesky, D., and Alvarez, F.

The influence of microstructure on the corrosion behavior of pulsed plasma nitrocarburized AISI H13 tool steel in NaCl 0.9 wt/V% solution is reported. The samples were prepared with different nitrocarburizing

treatment times using a constant [CH₄/H₂+N₂] gaseous mixture by a DC pulsed plasma system. The microstructure of the nitrocarburized layers was analyzed by scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS) and X-ray diffraction. The corrosion behavior was evaluated by potentiodynamic polarization experiments. The nitrocarburizing process considerably improves the corrosion resistance of the material in a NaCl environment as compared to the untreated H13 steel. The modified surface layer mainly consisting of epsilon-Fe₂₋₃(C,N) and gamma'-Fe₄N phases confers this outstanding behavior. The corrosion resistance dependence on specific nitrocarburizing processes is reported and the role of the surface porosity is discussed.

Surface & Coatings Technology 203[10-11], 1293-1297. 2009.

P071-09 "Irradiation induced texturing in the Mg_{0.95}Mn_{0.05}Fe₂O₄ ferrite thin film"

Sharma, S. K., Kumar, S., Thakur, P., Alimuddin, Choudhary, R. J., Phase, D. M., Meneses, C. T., Knobel, M., Lee, C. G., Singh, M., and Kumar, R.

We present a study on the effect of swift heavy ions irradiation on the structural and magnetic properties of Mg_{0.95}Mn_{0.05}Fe₂O₄ ferrite thin film grown by pulsed laser deposition technique. X-ray diffraction (XRD) pattern of the as-deposited film reveals a cubic spinel structure with an intermediate phase of alpha-Fe₂O₃. This impurity phase completely dissolves upon irradiation with 200 MeV Ag¹⁵⁺-ions and it exhibits a strong crystallographic texture along the (440) plane. The magnetization values start increasing systematically with irradiation at lower fluence values, whereas decrease for higher one. This decrease in magnetic signal can be attributed to partial amorphization caused by irradiation in agreement with XRD and atomic/magnetic force microscopic images.

Thin Solid Films 517[8], 2758-2761. 2009.

P072-09 "La-dilution effects in antiferromagnetic TbRhIn₅ single crystals"

Lora-Serrano, R., Garcia, D. J., Miranda, E., Adriano, C., Giles, C., Duque, J. G. S., and Pagliuso, P. G.

We report on measurements of temperature-dependent magnetic susceptibility, resonant x-ray magnetic scattering (XRMS), and heat capacity on single crystals of Tb_{1-x}La_xRhIn₅ for nominal concentrations in the range 0 <= x < 1. TbRhIn₅ is an antiferromagnetic (AFM) compound with T-N approximate to 46 K, which are the highest T-N values along the RRhIn₅ series (R: rare earth). We explore the suppression of the AFM state as a function of La doping considering the effects of La-induced dilution and perturbations to the tetragonal crystalline electrical field on the long-range magnetic interaction between the Tb³⁺ ions. Additionally, we also discuss the role of disorder. Our results and analysis are compared to the properties of the nondoped compound and of other members of the RRhIn₅ family and structurally related compounds (R₂RhIn₈ and RIn₃). The XRMS measurements reveal that the commensurate magnetic structure with the magnetic wave vector (01/21/2) observed for the nondoped compound is robust against doping perturbations in Tb_{0.6}La_{0.4}RhIn₅ compound

Physical Review B 79[2]. 024422. 2009.

P073-09 "Localization of electronic states in finite ladder models: Participation ratio and localization length as measures of the wave-function extension"

Carrillo-Nunez, H. and Schulz, P. A.

In this work we discuss and compare different definitions for localization of electronic states in low-dimensional systems. We choose a heuristic model for DNA-like molecules as a system prototype in order to establish ranges of equivalence for the localization length obtained from both the conductance and participation ratios. The results suggest also criteria to infer the extension of wave function in mesoscopic systems within the diffusive transport regime as complementary information to the localization length

Physical Review B 78[23]. 235404. 2008.

P074-09 "Low-energy electron collisions with acetic acid"

Freitas, T. C., Varella, M. T. D., da Costa, R. F., Lima, M. A. P., and Bettega, M. H. F.

We present cross sections for elastic collisions of low-energy electrons with acetic acid. We employed the Schwinger multichannel method with pseudopotentials in the static-exchange and static-exchange plus polarization approximations, for energies ranging from 0.1 to 10 eV. We found a pi(*) shape resonance around 1.7 eV, corresponding to the A(') symmetry of the C-s group. This resonant state was assigned to the experimental dissociative electron attachment peak at 1.7 eV yielding CH₃COO⁻+H. We also performed a series of electronic structure calculations using a small basis set for acetic, formic, and trifluoroacetic acids, which exhibit a similar behavior with respect to the dissociative electron attachment. We believe that hydrogen elimination triggered off by electron capture into a pi(*) resonance could be a general property of carboxylic acids

Physical Review A 79[2]. 022706. 2009.

P075-09 "Magnetic field dependence and bottlenecklike behavior of the ESR spectra in YbRh₂Si₂"

Duque, J. G. S., Bittar, E. M., Adriano, C., Giles, C., Holanda, L. M., Lora-Serrano, R., Pagliuso, P. G., Rettori, C., Perez, C. A., Hu, R. W., Petrovic, C., Maquilon, S., Fisk, Z., Huber, D. L., and Oseroff, S. B.

Electron spin resonance (ESR) experiments at different fields or frequencies (4.1 <= nu <= 34.4 GHz) in the Kondo lattice (T-K similar or equal to 25 K) YbRh₂Si₂ single-crystal compounds confirmed the observation of a single anisotropic Dysonian resonance with g(perpendicular to c) congruent to 3.55 and no hyperfine components for 4.2 less than or similar to T less than or similar to 20 K. However, our studies differently reveal that (i) the ESR spectra for H-perpendicular to c show strong-field-dependent spin-lattice relaxation, (ii) a weak-field and temperature-dependent effective g value, (iii) a dramatic suppression of the ESR intensity beyond 15% of Lu doping, and (iv) a strong sample and Lu-doping (<= 15%) dependence of the ESR data. These results suggest a different scenario where the ESR signal may be associated to a coupled Yb³⁺-conduction electron resonant collective mode with a strong bottleneck and dynamiclike behavior

Physical Review B 79[3]. 035122. 2009.

P076-09 "Magnetocaloric effect: Overcoming the magnetic limit"

Plaza, E. J. R. and Campoy, J. C. P.

We have studied anomalous peaks observed in magnetocaloric $\Delta S(T)$ curves for systems that undergo first-order magnetostructural transitions. The origin of those peaks, which can exceed the conventional magnetic limit, $Rln(2J+1)$, is discussed on thermodynamic bases by introducing an additional-exchange contribution (due to exchange constant variation arising from magnetostructural transition). We also applied a semiphenomenological model to include this additional-exchange contribution in Gd₅Si₂Ge₂ and MnAs-based systems, obtaining excellent results for the observed magnetocaloric effect.

Journal of Magnetism and Magnetic Materials 321[5], 446-449. 2009.

P077-09 “Microstructure and properties of the compound layer obtained by pulsed plasma nitriding in steel gears”

Ochoa, E. A., Wisnivesky, D., Minea, I., Ganciu, M., Tauziede, C., Chapon, P., and Alvarez, F.

The crystalline structure profile of the compound layer obtained by pulsed plasma nitriding in steel gears is reported. The nitrogen depth profile obtained by Radio Frequency Glow Discharge Optical Emission Spectroscopy is correlated with both the nano-hardness and the crystalline epsilon-Fe₃N/gamma'-Fe₄N phases identified in the nitrided layer by X-ray diffraction. These results show the importance to control the nitriding parameters to avoid abrupt hardness changes along the case that can jeopardize the gear performance.

Surface & Coatings Technology 203[10-11], 1457-1461. 2009.

P078-09 “Non-Gaussian two-mode squeezing and continuous-variable entanglement of linearly and circularly polarized light beams interacting with cold atoms”

Missori, R. J., de Oliveira, M. C., and Furuya, K.

We investigate how entangled coherent states and superpositions of low intensity coherent states of non-Gaussian nature can be generated via nonresonant interaction between either two linearly or circularly polarized field modes and an ensemble of X-like four-level atoms placed in an optical cavity. We compare our results to recent experimental observations and argue that the non-Gaussian structure of the field states may be present in those systems

Physical Review A 79[2]. 023801. 2009.

P079-09 “Observation of the smallest metal nanotube with a square cross-section”

Lagos, M. J., Sato, F., Bettini, J., Rodrigues, V., Galvao, D. S., and Ugarte, D.

Understanding the mechanical properties of nanoscale systems requires a range of measurement techniques and theoretical approaches to gather the relevant physical and chemical information. The arrangements of atoms in nanostructures and macroscopic matter can be different, principally due to the role of surface energy, but the interplay between atomic and electronic structure in association with applied mechanical stress can also lead to surprising differences. For example, metastable structures such as suspended chains of atoms(1-3) and helical wires(4,5) have been produced by stretching metal junctions. Here, we report the spontaneous formation of the smallest possible metal nanotube with a square cross-section during the elongation of silver nanocontacts. Ab initio calculations and molecular simulations indicate that the hollow wire forms because this configuration allows the surface energy to be minimized, and also generates a soft structure capable of absorbing a huge tensile deformation

Nature Nanotechnology 4[3], 149-152. 2009.

P080-09 “Oscillating holograms recorded in photorefractive crystals by a frequency detuned feedback loop”

Freschi, A. A., Telles, A. C. C., Frejlich, J., and Donatti, D. A.

We report an optoelectronic feedback loop suitable for generating noise-free interference patterns oscillating at arbitrary waveforms. The technique allows controlling the frequency detuning between the interfering beams through a phase modulator in a closed-loop interferometer. We use the dither signal method and propose a quasisynchronous demodulation scheme to create a phase modulated error signal for driving the loop. The dynamics of the interference fringes is easily controlled by a voltage waveform from a function generator, which is used in association with a time delay circuit for shifting the frequency of the reference signal used for lock-in demodulation. The technique is specially suited for applications involving low-frequency phase oscillations, such as those frequently encountered in the generation of space-charge waves in highly resistive photorefractive materials. The processing scheme allows real time monitoring of the hologram strength, and absolute values for the diffraction efficiency and the holographic phase shift can be obtained. Photorefractive wave oscillations ranging from approximately 100 mHz to 10 Hz were produced in a nominally undoped Bi₁₂TiO₂₀ sample. The technique can be readily applied to other fields of optical interferometry, such as for testing optical surfaces, optimizing adaptive holographic devices, measuring physical quantities, among other applications

Journal of Applied Physics 105[2]. 023109-023109-7. 2009.

P081-09 “Peculiarity of current-voltage characteristics of transferred arc burning in a limited volume”

Essiptchouk, A. M., Sharakhovsky, L. I., and Marotta, A.

Current-voltage characteristics (CVCs) of a transferred arc in a limited volume are reported. Experiments were carried out with a setup developed to reproduce the conditions which occur in a tundish equipped with a plasma system to keep the steel temperature at a predefined level. The experimental setup consists of a test chamber in which a plasma torch with a transferred arc is inserted on the top of the chamber cover and the anode is attached at the bottom. A ‘hysteresis’ of the CVC curves was observed during an increase and a decrease in the arc current. This phenomenon is explained by a long-lived ring-shaped vortex flow in the chamber, which is powered by the [image omitted] forces that at high currents act as an electromagnetic pump accelerating plasma in the direction of current expansion

Plasma Devices and Operations 17[1], 23-31. 2009.

P082-09 “Percolation processes and spin-reorientation of PrNi_{5-x}Co_x”

Rocco, D. L., Amaral, J. S., Leitao, J. V., Amaral, V. S., Reis, M. S., Fernandes, R. P., Pereira, A. M., Araujo, J. P., Martins, N. V., Tavares, P. B., and Coelho, A. A.

In the present work we report on the structural and magnetic behaviors of the PrNi_{5-x}Co_x intermetallic compounds. Due to the competition between the anisotropy energies of both Co and Pr sublattices, this series has a spin-reorientation phenomenon at low temperature (140 K). The Curie temperature, as a function of Co content, has a sudden increase above a critical concentration $x(c)$ similar to 1.9 and this feature is assigned as a percolation of geometrically spaced Co clusters. This assumption is explained based on the critical exponent of percolation theory. The series presents therefore a rich magnetic phase diagram, which could be established over a full doping range, i.e., from $x=0$ to $x=5$. We have also studied these compounds on the magnetocaloric point of view and found a quite large full width at half maximum (ΔT -FWHM) of the magnetic entropy change curves for some of the compositions, due to the merging of the ΔS peaks associated with

the spin-reorientation process and the Curie temperature T-C. In addition, the series has an appreciable relative cooling power, which is therefore suitable to be used in a magnetic refrigerator operating in a large range of temperature

Physical Review B 79[1]. 014428. 2009.

P083-09 “Performance investigation of microphotonic-silicon devices in a field-trial all-optical network”

Marconi, J. D., Cerqueira, A., Robinson, J. T., Sherwood-Droz, N., Okawachi, Y., Hernandez-Figueroa, H. E., Lipson, M., Gaeta, A. L., and Fragnito, H. L.

The performance of microphotonic-silicon devices in a geographically-distributed optical fiber network is experimentally investigated. Two different devices are tested: an optical filter based on a silicon ring resonator and an all-optical wavelength converter based on four-wave mixing in a dispersion-tailored highly nonlinear silicon waveguide. The evaluation of the devices is performed by means of eye diagrams and measurements of the bit error rate.

Optics Communications 282[5], 849-855. 2009.

P084-09 “Photonic band structure evolution of a honeycomb lattice in the presence of an external magnetic field”

Duque, C. A., Porrás-Montenegro, N., Cavalcanti, S. B., and Oliveira, L. E.

A standard plane-wave expansion technique is used to investigate the evolution of the photonic band structure of a two-dimensional honeycomb lattice composed by cylindrical shell rods with dielectric permittivities $\epsilon(1)$ and $\epsilon(2)$, and embedded in a background with permittivity $\epsilon(3)$. We have considered the effect of dispersive dielectric responses as well as the influence of an externally applied magnetic field aiming to obtain efficient tunable bandgaps. Present results suggest that a combination of a doped semiconductor constituent with an anisotropic geometry, which breaks symmetry and unfolds degeneracies, provides an efficient realization of photonic systems with tunable bandgaps

Journal of Applied Physics 105[3]. 034303-034303-5. 2009.

P085-09 “Size-dependent SERS enhancement of colloidal silver nanoplates: the case of 2-amino-5-nitropyridine”

Sant’Ana, A. C., Rocha, T. C. R., Santos, P. S., Zanchet, D., and Temperini, M. L. A.

Surface-enhanced Raman scattering (SERS) spectra of 2-amino-5-nitropyridine (ANP) adsorbed on colloidal silver triangular nanoplates were obtained using samples with different mean sizes and surface plasmon frequencies. The relative SERS enhancement factor for each sample was determined by the analysis of the normalized SERS excitation profiles of ANP vibrational modes for nanoplates in suspension, without aggregation. The SERS profiles are blue-shifted in relation to the localized surface plasmon peak. The detailed characterization of both morphology and concentration of the samples in addition to a rigorous normalization of the SERS spectra allowed a quantitative correlation between the SERS profiles and the mean size of the nanoplates. This correlation indicated the existence of an optimum size of the nanoplates for maximum Raman enhancement.

Journal of Raman Spectroscopy 40[2], 183-190. 2009.

P086-09 “Spectroscopic assignments of Ti³⁺ and Ti⁴⁺ in titanium-doped OH⁻ free low-silica calcium aluminosilicate glass and role of structural defects on the observed long lifetime and high fluorescence of Ti³⁺ ions”

Andrade, L. H. C., Lima, S. M., Novatski, A., Neto, A. M., Bento, A. C., Baesso, M. L., Gandra, F. C. G., Guyot, Y., and Boulon, G.

In this work we present the spectroscopic assignments of Ti³⁺ and Ti⁴⁺ in titanium-doped OH⁻ free low-silica calcium aluminosilicate glass and the influence of structural defects on the observed long lifetime and high fluorescence intensity of Ti³⁺ ions. Measurements were performed with electron-spin resonance (ESR), time resolved luminescence, ultraviolet-visible (UV-VIS) optical excitation and emission spectra, and conventional optical absorption and photoconductivity. The ESR data showed that the Ti³⁺/Ti⁴⁺ ratio increases with the doping concentration and that the Ti³⁺ ions are in distorted octahedral sites. The assignment of the Ti³⁺ and Ti⁴⁺ emission bands derived from the spectroscopic results allowed us to propose a model explaining the mechanisms involved in the luminescence processes. The long lifetime of the Ti³⁺ emission around 650 nm (on the order of 170 μ s) is about two orders of magnitude higher than the values found in the literature and was associated to the trapping of the excited electrons by the glass defects followed by detrapping via defect recombination. In conclusion, the combination of several techniques permitted a comprehensive characterization of the Ti ions in this OH⁻ free glass

Physical Review B 78[22]. 224202. 2008.

P087-09 “Spin current in the Mobius cyclacene belts”

dos Santos, M. C. and Alvarez, F.

We report on density functional theory studies of the electronic structure and magnetic properties of Mobius-[n]cyclacenes. The geometry of Mobius bands presents a modulation of bond lengths that is needed to accommodate the twist. This modulation takes the form of bond alternation defects analogous to those of solitons in polyacetylene. The ground state of all Mobius bands is a triplet, with a spin density distribution that follows the bond length modulation. A molecular dynamics simulation of the Mobius cyclacene at 300 K shows that the twist travels around the belt inducing a magnetic current.

Chemical Physics Letters 471[4-6], 276-279. 2009.

P088-09 “Structural and kinetic characterization of a maize aldose reductase”

de Sousa, S. M., Rosselli, L. K., Kiyota, E., da Silva, J. C., Souza, G. H. M. F., Peroni, L. A., Stach-Machado, D. R., Eberlin, M. N., Souza, A. P., Koch, K. E., Arruda, P., Torriani, I. L., and Yunes, J. A.

The aldo-keto reductases (AKRs) are classified as oxidoreductases and are found in organisms from prokaryotes to eukaryotes. The AKR superfamily consists of more than 120 proteins that are distributed throughout 14 families. Very few plant AKRs have been characterized and their biological functions remain largely unknown. Previous work suggests that AKRs may participate in stress tolerance by detoxifying reactive aldehyde species. In maize endosperm, the presence of an aldose reductase (AR; EC 1.1.1.21) enzyme has also been hypothesized based on the extensive metabolism of sorbitol. This manuscript identifies and characterizes an AKR from maize (*Zea mays* L.) with features of an AR. The cDNA clone, classified as AKR4C7, was expressed as a recombinant His-tag fusion protein in *Escherichia coli*. The product was purified by immobilized metal affinity chromatography followed by anion exchange chromatography. Circular dichroism spectrometry and SAXS analysis indicated that the AKR4C7 protein was stable, remained folded throughout the purification process, and formed monomers of a globular shape, with a molecular envelope similar to human AR. Maize AKR4C7 could utilize DL-glyceraldehyde and some pentoses as substrates. Although the maize AKR4C7 was able to convert sorbitol to

glucose, the low affinity for this substrate indicated that AKR4C7 was probably a minimal contributor to sorbitol metabolism in maize seeds. Polyclonal antisera raised against AKR4C7 recognized at least three AR-like polypeptides in maize kernels, consistent with the presence of a small gene family. Diverse functions may have evolved for maize AKRs in association with specific physiological requirements of kernel development.

Plant Physiology and Biochemistry 47[2], 98-104. 2009.

P089-09 “Study of the electronic properties of GaAs-based atomic layer doped field effect transistor (ALD-FET) under the influence of hydrostatic pressure”

Martinez-Orozco, J. C., Rodriguez-Vargas, I., Duque, C. A., Mora-Ramos, M. E., and Gaggero-Sager, L. M.

Based on a Thomas-Fermi envelope function scheme we perform the calculation of the electronic structure of a GaAs atomic layer doped field effect transistors (ALD-FET). We calculate the electronic structure for the device as a function of the involved parameters, in particular we study the effects of the hydrostatic pressure onto the electronic level structure in order to investigate the formation of high conductivity electron channels in such devices. We consider the pressure-induced F-X crossover within the conduction band as a possible effect causing the enhancement of the associated two-dimensional carrier densities.

Physica Status Solidi B-Basic Solid State Physics 246[3], 581-585. 2009.

P090-09 “Sudden stratospheric warmings seen in MINOS deep underground muon data”

Osprey, S., Barnett, J., Smith, J., Adamson, P., Andreopoulos, C., Arms, K. E., Escobar, C. O., et al

The rate of high energy cosmic ray muons as measured underground is shown to be strongly correlated with upper-air temperatures during short-term atmospheric (10-day) events. The effects are seen by correlating data from the MINOS underground detector and temperatures from the European Centre for Medium Range Weather Forecasts during the winter periods from 2003-2007. This effect provides an independent technique for the measurement of meteorological conditions and presents a unique opportunity to measure both short and long-term changes in this important part of the atmosphere. Citation: Osprey, S., et al. (2009), Sudden stratospheric warmings seen in MINOS deep underground muon data.

Geophysical Research Letters 36. L05809. 2009.

P091-09 “The photothermal transparent transducer method applied to the spectroscopy of liquids”

de Paula, M. H., Lemos, G. M., do Amaral, M. S., Nunes, J. R., Lourenco, A., de Carvalho, A. A., Kitano, C., da Silva, J. G., Sakamoto, W. K., Siqueira, O. S., Mello, G. A. B., Pinto, J. O. P., Galotto, L., and Peres, M. T. L. P.

A new kind of spectroscopy of liquids is presented: the photothermal transparent transducer method applied to the spectroscopy

of liquid samples. The liquid sample is placed in a small (approximately 20 ml) chamber with a LiTaO₃ pyroelectric crystal as window. The sample excitation and signal analysis could be made using modulated or pulsed techniques. Samples with low to high absorbance could be easily analyzed, including on-line experiments.

Sensors and Actuators B-Chemical 136[2], 287-289. 2009.

P092-09 “Theoretical calculations of nonlinear electronic transport behavior in III-nitrides: GaN and AlN”

Rodrigues, C. G., Vasconcellos, A. R., and Luzzi, R.

The dependence of the mobility in n-doped III-nitrides on the electric field strength and the concentration of electrons and impurities is derived. Such dependence is determined by the nonequilibrium thermodynamic state of the system, which is led to far-from equilibrium conditions by the action of intermediate to strong electric fields. It is shown that the mobility decreases with the increase of the electric field strength and the concentration of carriers, in a way evidencing the influence of the nonlinear transport involved. Dependence of the mobility with the concentration following two types of regimes characterized by exponential laws are evidenced. They can also be approximately described by fractional power laws. The influence of the thermal bath temperature is also analyzed.

Physica Status Solidi B-Basic Solid State Physics 246[2], 417-425. 2009.

P093-09 “White-Light imaging in a two gratings diffraction process”

J.J. Lunazzi, N.I.R. Rivera

A diffractive arrangement that allows imaging of an object without any intermediate or complementary element is presented. This optical system with only two diffraction gratings forms color images with white light.

Journal of Optics : the Optical Society of India, v. 37, n.2, p.56-62, April-June 2008

P094-09 “Zero-Point Vacancy Concentration in a Model Quantum Solid: A Reversible-Work Approach”

Pessoa, R., de Koning, M., and Vitiello, S.

We investigate the influence of anharmonic effects on the zero-point vacancy concentration in a boson system model in the solid phase at T=0 K. We apply the reversible-work method to compute the vacancy formation free energy and the vacancy concentration in the system. A comparison of our results with those obtained using the harmonic approximation show that anharmonic effects reduce the formation free energy by similar to 25%, leading to an increase of the zero-point vacancy concentration by more than an order of magnitude

Journal of Statistical Physics 134[4], 769-780. 2009.

Abstracta

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