

# Abstracta

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## TRABALHOS ACEITOS PARA PUBLICAÇÃO

A 011-07    Size Limit to Defect Formation in Pyramidal Pt Nanocontacts

## TRABALHOS PUBLICADOS

NOVEMBRO/2007 à DEZEMBRO/2007

P 234- 07 à P 277- 07

## TRABALHOS PUBLICADOS

### P234-07 "Annealing effects on 5 nm iron oxide nanoparticles"

Vargas, J. M., Lima, E., Socolovsky, L. M., Knobel, M., Zanchet, D., and Zysler, R. D.

Morphological, structural and magnetic properties of 4.8 nm iron oxide nanoparticles have been investigated after annealing under inert atmosphere at different temperatures. The as-prepared iron oxide nanoparticles have been synthesized by chemical route from high temperature reaction of Fe(acac)<sub>3</sub> solution in presence of oleic acid and oleylamine surfactant. Annealing the particles at low temperatures (T<sub>ann</sub> = 573 K) produces an increment of the mean size from 4.8 nm to 6.0 nm, preserving the same morphology. The coercive field of the annealed sample has a small increasing with respect to the as-prepared sample in agreement with the mean particle volume change. Annealing at higher temperature (T<sub>ann</sub> = 823 K) leads to a bimodal size distribution of the iron oxide nanoparticles with 6.0 nm and 17 nm mean sizes respectively, where the bigger particles dominate the observed magnetic properties

Journal of Nanoscience and Nanotechnology 7[9], 3313-3317. 2007

### P235-07 "Band-structure properties of photonic superlattices"

Cavalcanti, S. B., Dios-Leyva, M., Reyes-Gomez, E., and Oliveira, L. E.

The band structure of a one-dimensional periodic array composed of two different layers of dimensions *a* and *b* characterized by refractive indices *n*(1) and *n*(2), respectively, is investigated. Refractive indices may take on positive as well as negative values. Within the Maxwell framework and using a transfer matrix technique for one dimensional periodic eigen-problems, we have determined a general equation, which governs the photonic band structure and the density of states (DOS) of one-dimensional photonic crystals. In addition to the well-known existence of the band gaps, we show that, depending on the width relationship *b/a* between the layer materials, super-lattices with null photonic band gap may exist and the conditions for such occurrences are established. Furthermore, we have been able to study the so-called *n* = 0 non-Bragg gap, ground  $\omega(0)$ , for which the average refraction felt by the propagating radiation is null

Optics and Spectroscopy 103[3], 349-353. 2007.

### P236-07 "Carrier dynamics in stacked InP/GaAs quantum dots"

Veloso, A. B., Nakaema, M. K. K., de Godoy, M. P. F., Lopes, J. M. J., Iikawa, F., Brasil, M. J. S. P., Bortoleto, J. R. R., Cotta, M. A., Fichtner, P. F. P., Morschbacher, M., and Madureira, J. R.

We investigated two stacked layers of InP/GaAs type-II quantum dots by transmission electron microscopy and optical spectroscopy. The results reveal that InP quantum dots formed in two quantum dot layers are more uniform than those from a single layer structure. The thermal activation energies as well as the photoluminescence decays are rather independent of the separation between quantum dot layers and the presence of the second layer. The quantum dot optical emission persists for thermal activation energy larger than the calculated exciton binding energy. The photoluminescence decay is relatively fast for type-II alignment

Applied Physics Letters 91[12]. 2007.

### P237-07 "Correlation of the highest-energy cosmic rays with nearby extragalactic objects"

Abraham, J., et al...

Using data collected at the Pierre Auger Observatory during the past 3.7 years, we demonstrated a correlation between the arrival directions of cosmic rays with energy above  $6 \times 10^{19}$  electron volts and the positions of active galactic nuclei (AGN) lying within similar to

75 megaparsecs. We rejected the hypothesis of an isotropic distribution of these cosmic rays with at least a 99% confidence level from a prescribed a priori test. The correlation we observed is compatible with the hypothesis that the highest-energy particles originate from nearby extragalactic sources whose flux has not been substantially reduced by interaction with the cosmic background radiation. AGN or objects having a similar spatial distribution are possible sources

Science 318[5852], 938-943. 2007.

### P238-07 "Cure temperature influence on natural rubber-A small angle x-ray scattering study"

Salgueiro, W., Somoza, A., Torrián, I. L., and Marzocca, A. J

To analyze the natural rubber behavior during vulcanization under different cure treatments, an experimental investigation using small angle X-ray scattering was performed. To achieve this, a set of samples were prepared using sulfur and N-t-butyl-2-benzothiazole sulfenamide as accelerator and then cured at temperatures between 403 and 463 K reaching their optimum mechanical properties considering rheometer tests. The crosslink density of the samples was evaluated by means of the swelling technique in solvent. In the usual Lorentz corrected representation of the X-ray scattered intensity, a maximum was observed in the plots corresponding to the cured samples, revealing a highly correlated structure. This maximum shifted toward higher values of the scattering vector when the cure temperature of the samples increased. This behavior is discussed in terms of the crosslinks type present in the vulcanized rubber network at different cure temperatures. (C) 2007 Wiley Periodicals, Inc

Journal of Polymer Science Part B-Polymer Physics 45[21], 2966-2971. 2007.

### P239-07 "Evaluation of intramolecular energy transfer process in the lanthanide(III) bis- and tris-(TTA) complexes: Photoluminescent and triboluminescent behavior"

Teotonio, E. E. S., Fett, G. M., Brito, H. F., Faustino, W. M., de Sa, G. F., Felinto, M. C. F. C., and Santos, R. H. A.

This work reports the energy transfer mechanism process of [Eu(TTA)<sub>2</sub>(NO<sub>3</sub>)(TPPO)<sub>2</sub>] (bis-TTA complex) and [Eu(TTA)<sub>3</sub>(TPPO)<sub>2</sub>] (tris-TTA complex) based on experimental and theoretical spectroscopic properties, where TTA = 2-thienoyltrifluoroacetone and TPPO = triphenylphosphine oxide. These complexes were synthesized and characterized by elemental analyses, infrared spectroscopy and thermogravimetric analysis. The theoretical complexes geometry data by using Sparkle model for the calculation of lanthanide complexes (SLMC) is in agreement with the crystalline structure determined by single-crystal X-ray diffraction analysis. The emission spectra for [Gd(TTA)<sub>3</sub>(TPPO)<sub>2</sub>] and [Gd(TTA)<sub>2</sub>(NO<sub>3</sub>)(TPPO)<sub>2</sub>] complexes are associated to T → S-0 transitions centered on coordinated TTA ligands. Experimental luminescent properties of the bis-TTA complex have been quantified through emission intensity parameters  $\Omega(\lambda)$  ( $\lambda = 2$  and 4), spontaneous emission rates (*A*(rad)), luminescence lifetime ( $\tau$ ), emission quantum efficiency ( $\eta$ ) and emission quantum yield (*q*), which were compared with those for tris-TTA complex. The experimental data showed that the intensity parameter value for bis-TTA complex is twice smaller than the one for tris-TTA complex, indicating the less polarizable chemical environment in the system containing nitrate ion. A good agreement between the theoretical and experimental quantum yields for both Eu(III) complexes was obtained. The triboluminescence (TL) of the [Eu(TTA)<sub>2</sub>(NO<sub>3</sub>)(TPPO)<sub>2</sub>] complexes are discussed in terms of ligand-to-metal energy transfer. (c) 2007 Elsevier B.V. All rights reserved

Journal of Luminescence 128[2], 190-198. 2008.

**P 240-07 "Exchange and crystal field effects in the ESR spectra of Eu<sup>2+</sup> in LaB<sub>6</sub>"**

Duque, J. G. S., Urbano, R. R., Venegas, P. A., Pagliuso, P. G., Rettori, C., Fisk, Z., and Oseroff, S. B.

Electron spin resonance of Eu<sup>2+</sup> (4f<sup>7</sup>, S=7/2) in a La hexaboride (LaB<sub>6</sub>) single crystal shows a single anisotropic Dysonian resonance. From the observed negative g shift of the resonance, it is inferred that the Eu<sup>2+</sup> ions are covalent exchange coupled to the B 2p-like host conduction electrons. From the anisotropy of the spectra (linewidth and field for resonance), we found that the S ground state of Eu<sup>2+</sup> ions experience a cubic crystal field of a negative fourth order crystal field parameter (CFP), b(4)=-11.5(2.0) Oe, in agreement with the negative fourth order CFP, A(4), found for the non-S ground state R hexaborides. These results support covalency as the dominant contribution to the fourth order CFP for the whole R hexaboride family

*Physical Review B* 76[12]. 2007.

**P 241-07 "External power-enhancement cavity versus intracavity frequency doubling of Ti : sapphire lasers using BIBO"**

Cruz, L. S. and Cruz, F. C.

We report on continuous-wave second harmonic generation of near infrared Ti: sapphire lasers using room temperature critically phasematched, angle-tuned BIBO ( bismuth triborate, BiB<sub>3</sub>O<sub>6</sub>) crystals, placed both in an external power enhancement cavity and inside the laser resonator. In the first case we generate 70 mW of single-frequency radiation at 423 nm for 330 mW of input power at 846 nm. For intracavity frequency doubling we achieve 690 mW at 423 nm for 7.3 Watts of the Ti: sapphire laser pump power at 532 nm, representing a conversion efficiency of 9.5% from 532 to 423 nm. These tunable blue-violet systems are particularly attractive for laser cooling and trapping of alkaline-Earth atoms. (C) 2007 Optical Society of America

*Optics Express* 15[19], 11913-11921. 2007.

**P 242-07 "First CNGS events detected by LVD"**

Agafonova, N. Y., et al...

The CERN Neutrino to Gran Sasso (CNGS) project aims to produce a high energy, wide band nu(mu) beam at CERN and send it toward the INFN Gran Sasso National Laboratory (LNGS), 732 km away. Its main goal is the observation of the nu(tau) appearance, through neutrino flavour oscillation. The beam started its operation in August 2006 for about 12 days: a total amount of 7.6 x 10<sup>17</sup> protons were delivered to the target. The LVD detector, installed in hall A of the LNGS and mainly dedicated to the study of supernova neutrinos, was fully operating during the whole CNGS running time. A total number of 569 events were detected in coincidence with the beam spill time. This is in good agreement with the expected number of events from Monte Carlo simulations

*European Physical Journal C* 52[4], 849-855. 2007.

**P 243-07 "GaN nano- and micro-spheres fabricated selectively on silicon"**

Barea, L. A. M., von Zuben, A. A. G., Marquez, A. Z., and Frateschi, N. C.

This work presents the selective growth of three-dimensional metallic gallium nitride structures on silicon substrates by chemical beam epitaxy (CBE) with a subsequent plasma nitridation process. The use of titanium pre-deposited stripes over silicon (100) is shown to provide high selectivity where spherical and semi-spherical structures are obtained only over the metal. These structures have diameters ranging from 100 nm to 3 mu m depending on the growth conditions. The nitridation process was performed on an electron cyclotron resonance (ECR) plasma system. Raman micro-spectroscopy results showed GaN formation with zinc blend crystal structure and photoluminescence emission in the visible spectrum in a range between 350 and 650 nm. (C) 2007 Elsevier B.V. All rights reserved

*Journal of Crystal Growth* 308[1], 37-40. 2007.

**P 244-07 "Generalized quantum telecloning"**

Gordon, G. and Rigolin, G

We present a generalized telecloning (GTC) protocol where the quantum channel is non-optimally entangled and we study how the fidelity of the telecloned states depends on the entanglement of the channel. We show that one can increase the fidelity of the telecloned states, achieving the optimal value in some situations, by properly choosing the measurement basis at Alice's, albeit turning the protocol to a probabilistic one. We also show how one can convert the GTC protocol to the teleportation protocol via proper unitary operations

*European Physical Journal D* 45[2], 347-353. 2007.

**P 245-07 "High field phase diagram of CeCoIn<sub>5</sub>: A magnetization study"**

Ferreira, L. M., Pagliuso, P. G., Urbano, R. R., Gratens, X., Oliveira, N. F., Movshovich, R., Sarrao, J. L., and Thompson, J. D

We have performed magnetization and magnetic relaxation measurements on high-quality single crystals of CeCoIn<sub>5</sub> at temperatures down to 28 mK and fields up to 17 T. The experiments were carried out by means of a force magnetometer operating in a plastic dilution refrigerator in a 18 T magnet. Data were collected with magnetic field applied both parallel and perpendicular to the ab-plane. For both orientations, pure magnetization signal reveals subtle changes in behavior in a very narrow field range near H-c<sub>2</sub>. The possible formation of the FFLO state in CeCoIn<sub>5</sub> and how the vortices' dynamics evolve when crossing such state is discussed on the basis of our results. (C) 2007 Elsevier B.V. All rights reserved

*Physica C-Superconductivity and Its Applications* 460, 674-675. 2007.

**P 246-07 "Inexpensive two-tip nanomanipulator for a SEM"**

Nakabayashi, D., Silva, P. C., and Ugarte, D.

One of the major obstacles for nanotechnology progress is the lack of effective tools and processes to build, characterize and manipulate nanosystems. Here, we present the development of a low-cost nanomanipulator with two probe tips that operates inside a scanning electron microscope. This manipulation system is based on parallel-guiding-plate-spring mechanism and inexpensive materials. The movements are divided on coarse and fine displacements, which are based on picomotors and piezoelectric elements, respectively. The nanomanipulator was applied to transport and manipulate nanotubes and semiconductor nanowires. The probe tips have independent electrical contacts, so that electrical two point measurements can be performed in situ. The system is expected to be a valuable tool for research laboratories working with nanostructures. (C) 2007 Elsevier B.V. All rights reserved

*Applied Surface Science* 254[1], 405-411. 2007.

**P 247-07 "Influence of the material and the surface roughness of the drying support on the self-detachment of maltodextrin films"**

Collares-Oueiroz, F. P., Cotta, M. A., Finzer, J. R. D., and Kieckbusch, T. G.

The influence of four different materials (glass, stainless steel, polytetrafluoroethylene PTFE and polyamide) used as a paste drying support on the detachment conditions of dried maltodextrin films was investigated. The tests were accomplished in a drying chamber that allows the spreading of a uniform film of pastelike material over solid plates and the visual observation of the instant of the detachment from the surface. The chamber temperature and the water content of the dried film were compared with the corresponding glass transition temperature curve. The effect of the material roughness on the detachment of the dried maltodextrin film was evaluated comparing glass plates with two different surfaces (smooth and sand-blasted glass). Results indicate that the higher the surface roughness, the drier should the film be, in order to promote self-detachment at the same temperature conditions. The chemical and physical interactions between the support material and the dried film also influence the process. The PTFE support required less severe detachment conditions than solids with lower surface roughness

*Starch-Starke* 59[10], 498-503. 2007.

**P248-07 "Influence of ultrasound irradiation on the adsorption of bovine serum albumin on copper"**

Pinto, E. M., Soares, D. M., and Brett, C. M. A.

The effect of irradiation by power ultrasound on the adsorption of proteins on copper has been investigated, using bovine serum albumin (BSA) as a model protein in pH 7 phosphate buffer solution. Open circuit potential measurements, cyclic voltammetry and electrochemical impedance spectroscopy were used to characterise the copper/solution interface. Electrochemical impedance measurements at potentials close to the open circuit potential showed that pulsed ultrasound irradiation removes the naturally formed copper oxide films in phosphate buffer solution, and that their re-formation can lead to an oxide film with different electrical characteristics. Adsorption of BSA blocks the surface, decreasing or increasing the interfacial resistance, depending on the applied potential and the oxide characteristics, as well as changing the interfacial capacitance. This study augurs well for application of the combination of electrochemical impedance plus ultrasound to other systems

*Journal of Applied Electrochemistry* 37[11], 1367-1373. 2007.

**P249-07 "Interaction intimacy affects structure and coevolutionary dynamics in mutualistic networks"**

Guimares, P. R., Rico-Gray, V., Oliveira, P. S., Izzo, T. J., dos Reis, S. F., and Thompson, J. N.

The structure of mutualistic networks provides clues to processes shaping biodiversity [1-10]. Among them, interaction intimacy, the degree of biological association between partners, leads to differences in specialization patterns [4, 11] and might affect network organization [12]. Here, we investigated potential consequences of interaction intimacy for the structure and coevolution of mutualistic networks. From observed processes of selection on mutualistic interactions, it is expected that symbiotic interactions (high-interaction intimacy) will form species-poor networks characterized by compartmentalization [12,13], whereas nonsymbiotic interactions (low intimacy) will lead to species-rich, nested networks in which there is a core of generalists and specialists often interact with generalists [3, 5, 7,12,14]. We demonstrated an association between interaction intimacy and structure in 19 ant-plant mutualistic networks. Through numerical simulations, we found that network structure of different forms of mutualism affects evolutionary change in distinct ways. Change in one species affects primarily one mutualistic partner in symbiotic interactions but might affect multiple partners in nonsymbiotic interactions. We hypothesize that coevolution in symbiotic interactions is characterized by frequent reciprocal changes between few partners, but coevolution in nonsymbiotic networks might show rare bursts of changes in which many species respond to evolutionary changes in a single species

*Current Biology* 17[20], 1797-1803. 2007.

**P250-07 "Is it possible to grow amorphous normal nanosprings?"**

Fonseca, A. F., Malta, C. P., and Galvao, D. S.

Nanosprings have been objects of intense investigations in recent years. They can be classified as normal or binormal depending on the geometry of their cross-section. As normal amorphous nanosprings have not yet been observed experimentally, we have decided to investigate this matter. We discuss the shape of the catalyst in terms of the cross-sectional shape of the nanospring and show that, within the vapor - liquid - solid model, the growth of amorphous binormal nanosprings is energetically favored

*Nanotechnology* 18[43]. 2007.

**P251-07 "Isotopic liftings of clifford algebras and applications in elementary particle mass matrices"**

da Rocha, R. and Vaz, J.

Isotopic liftings of algebraic structures are investigated in the context of Clifford algebras, where it is defined a new product involving an arbitrary, but fixed, element of the Clifford algebra. This element acts as the unit with respect to the introduced product, and is called isounit. We construct isotopies in both associative and non-associative arbitrary algebras, and examples of these constructions are exhibited using Clifford algebras, which although associative, can generate the octonionic, non-associative, algebra. The whole formalism is developed in a Clifford algebraic arena, giving also the necessary pre-requisites to introduce isotopies of the exterior algebra. The flavor hadronic symmetry of the six u,d,s,c,b,t quarks is shown to be exact, when the generators of the isotopic Lie algebra  $su(6)$  are constructed, and the unit of the isotopic Clifford algebra is shown to be a function of the six quark masses. The limits constraining the parameters, that are entries of the representation of the isounit in the isotopic group  $SU(6)$ , are based on the most recent limits imposed on quark masses

*International Journal of Theoretical Physics* 46[10], 2464-2487. 2007.

**P252-07 "Line tension at high contact angle wetting: Contribution to interfacial energy at long distances (> 100 angstrom) from the triple line contour"**

Teschke, O. and de Souza, E. F.

We measured water/air interfacial energy as functions of the finest texture radius of annealed PTFE substrates where air bubbles are anchored. The calculated line tension from measured force vs distance curves for a 7 nm PTFE substrate texture radius is  $(28 \pm 8) \times 10^{-9}$  N. However, the most surprising aspect is that this effect is not restricted to the triple line vicinity, previously estimated to be similar to 100 Å but spreads all over the water/air bubble interface. The proposed method is an alternative to the controversial contact angle measurement for estimating the line tension contribution. (C) 2007 Elsevier B.V. All rights reserved

*Chemical Physics Letters* 447[4-6], 379-383. 2007.

**P253-07 "Low cost data acquisition module for evaluating the quantitative performance of daylight systems"**

Ciampini, F., Scarazzato, P. S., Neves, A. A. R., Pereira, D. C. L., and Yamanaka, M. H.

The search for efficient, auto-sustainable constructions that allows the user a contact with the outer environment has stimulated the development of advanced strategies, in various devices, for the exploitation of the daylight. A low cost data acquisition system was developed in this study, to observe the distribution of the natural light inside a prototype and to evaluate the quantitative performance for redirecting systems. The luminous sensor is a light dependent resistor, that responds to the illuminance with a reduction in the resistance when illuminated, through a log-log dependence. Calibration curves are set up to relate the change of resistance to absolute illuminance. It therefore provides a continuous investigation of the illuminance for various sampled points in the interior test space with a 0.03% digital error due to the 12-bit resolution. The final measured error of 5% is mainly due to the system calibration and resistance memory history. The circuit connects to a standard parallel port of any Personal Computer and supplies 64 analog inputs, one for each luminous sensor. The circuit can be easily modified to attend different quantities of analog inputs or communication ports. (c) 2007 Elsevier Ltd. All rights reserved

*Solar Energy* 81[9], 1187-1190. 2007.

**P 254-07 "Magnetic circular dichroism instrumentation at LNLS"**

Fonseca, P. T., de Castro, A. R. B., Tosin, G., Citadini, J. F., and Basilio, R

We describe the high-field (1.0 T) ultra high vacuum ( $1.6 \cdot 10^{-9}$  mbar) controllable temperature ( $\approx 8$  degrees K up to  $> 350$  degrees K) MCD setup designed and built at LNLS. We show, for nanocrystals of Hematite  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>, illustrative results obtained at room and at low temperature

*Brazilian Journal of Physics* 37[3B], 1171-1176. 2007.

**P 255-07 "Magnetic structure of Sm<sub>2</sub>IrIn<sub>8</sub> determined by x-ray resonant magnetic scattering"**

Adriano, C., Lora-Serrano, R., Giles, C., de Bergevin, F., Lang, J. C., Srajer, G., Mazzoli, C., Paolasini, L., and Pagliuso, P. G.

The magnetic structure of the intermetallic antiferromagnet Sm<sub>2</sub>IrIn<sub>8</sub> was determined using x-ray resonant magnetic scattering. Below T<sub>N</sub>=14.2 K, Sm<sub>2</sub>IrIn<sub>8</sub> has a commensurate antiferromagnetic structure with a propagation vector  $\eta=(1/2,0,0)$ . The Sm magnetic moments lie in the ab plane and are rotated roughly 18 degrees away from the a axis. The magnetic structure of this compound was obtained by measuring the strong dipolar resonant peak whose enhancement was of over 2 orders of magnitude at the L-2 edge. At the L-3 edge, both quadrupolar and dipolar features were observed in the energy line shape. The magnetic structure and properties of Sm<sub>2</sub>IrIn<sub>8</sub> are found to be consistent with the general trend already seen for the Nd-, Tb-, and the Ce-based compounds from the R<sub>m</sub>MnIn<sub>3m+2n</sub> family (R=rare earth; M=Rh or Ir; m=1,2; n=0,1), where the crystalline electrical field effects determine the direction of magnetic moments and the T-N evolution in the series. The measured Neel temperature for Sm<sub>2</sub>IrIn<sub>8</sub> is slightly suppressed when compared to the T-N of the parent cubic compound SmIn<sub>3</sub>

*Physical Review B* 76[10]. 2007.

**P 256-07 "Magnetically driven maser effect in the resonant dynamics of V-15 molecular nanomagnets"**

Dartora, C. A., Cabrera, G. G., and Nobrega, K. Z.

Resonant dynamics of magnetic molecules with spin 1/2 ground state, such as V-15, is theoretically studied. In our model calculation, crystals of this molecular nanomagnet are probed by time-dependent magnetic fields, which continuously invert populations of spin states. If the sample is placed in a resonant cavity, relaxation of excited states, via spin-photon interaction, allows for stimulated emission of radiation in the microwave range at resonance

*Brazilian Journal of Physics* 37[3B], 1147-1154. 2007.

**P 257-07 "Measurement of the atmospheric muon charge ratio at TeV energies with the MINOS detector"**

Adamson, P., et al...

The 5.4 kton MINOS far detector has been taking charge-separated cosmic ray muon data since the beginning of August, 2003 at a depth of 2070 m.w.e. in the Soudan Underground Laboratory, Minnesota, USA. The data with both forward and reversed magnetic field running configurations were combined to minimize systematic errors in the determination of the underground muon charge ratio. When averaged, two independent analyses find the charge ratio underground to be  $N_{\mu(+)} / N_{\mu(-)} = 1.374 \pm 0.004(\text{stat}) \pm 0.010(\text{+}0.012)(\text{sys})$ . Using the map of the Soudan rock overburden, the muon momenta as measured underground were projected to the corresponding values at the surface in the energy range 1-7 TeV. Within this range of energies at the surface, the MINOS data are consistent with the charge ratio being energy independent at the 2 standard deviation level. When the MINOS results are compared with measurements at lower energies, a clear rise in the charge ratio in the energy range 0.3-1.0 TeV is apparent. A qualitative model shows that the rise is consistent with an increasing contribution of kaon decays to the muon charge ratio

*Physical Review D* 76[5]. 2007.

**P 258-07 "Models for guidance in kagome-structured hollow-core photonic crystal fibres"**

Pearce, G. J., Wiederhecker, G. S., Poulton, C. G., Burger, S., and Russell, P. S. J.

We demonstrate by numerical simulation that the general features of the loss spectrum of photonic crystal fibres (PCF) with a kagome structure can be explained by simple models consisting of thin concentric hexagons or rings of glass in air. These easily analysed models provide increased understanding of the mechanism of guidance in kagome PCF, and suggest ways in which the high-loss resonances in the loss spectrum may be shifted. (C) 2007 Optical Society of America *Optics Express* 15[20], 12680-12685. 2007.

**P 259-07 "Nanomanipulation and characterisation of individual nano-objects inside a SEM"**

Nakabayashi, D., Silva, P. C., and Ugarte, D.

This paper describes the use of nanomanipulation for deforming, picking up and positioning nano-objects in situ in a field emission scanning electron microscope using an in-house built manipulator. Our experiments demonstrate that physical manipulation can be used in a wide range of different experiments and systems. The scope of possibilities is quite large, from mounting nanodevices to fabricating AFM tips based on CNTs in addition to measuring mechanical and electrical properties of individual nanosystems. Nanomanipulation has a large application potential in physics, chemistry, biology and engineering, rendering possible the idealised bottom-up approach to nanotechnology *International Journal of Nanotechnology* 4[5], 609-617. 2007.

**P 260-07 "Nonlinear hole transport and nonequilibrium thermodynamics in group III-nitrides under the influence of electric fields"**

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

A theoretical study on the nonlinear transport of holes and of the nonequilibrium thermodynamic characteristics of p-doped wurtzite gallium nitride (GaN), aluminium nitride (AlN), and indium nitride (InN), under the influence of moderate to high electric fields, is presented. It is based on a nonlinear quantum kinetic theory which provides a description of the dissipative phenomena developing in the system. The ultrafast time evolution of the hole drift velocity and of the quasitemperatures of holes and longitudinal optical phonons are obtained. The steady state is analyzed by determining the dependence on the electric field of the nonequilibrium thermodynamic state and of the non-Ohmic mobility. A velocity overshoot is evidenced. (C) 2007 American Institute of Physics *Journal of Applied Physics* 102[7]. 2007.

**P 261-07 "On the trapping of Bjerrum defects in ice I-h: The case of the molecular vacancy"**

de Koning, M. and Antonelli, A.

We present a density-function theory (DFT) study of Bjerrum-defect trapping centers involving the molecular vacancy in ice I-h. As a first step, we compute the intrinsic migration barrier to D-defect motion using the nudged elastic band (NEB) method and find them to be of the same order of magnitude as the energy barriers involving intrinsic L-defect motion. This finding suggests that intrinsic mobility factors cannot explain the experimentally observed inactivity of D defects, supporting the idea that D defects are trapped at other lattice-defect sites. Next we study the defect complexes formed by the combination of isolated D and L defects with a molecular vacancy. The corresponding geometries show that the formation of these aggregates significantly reduces elastic distortions that are present in isolated Bjerrum defects. An analysis of the energetics involved in the formation of both defect complexes reveals a significant binding energy, indicating that the molecular vacancy represents a strong trapping center for Bjerrum defects. On the other hand, the fact that there is no difference between the absolute values of the binding energies for both D and L defects suggests that the vacancy affects both species of Bjerrum defects in a similar fashion, possibly ruling out the vacancy trapping centers as an explanation for the experimentally observed inactivity of D defects

*Journal of Physical Chemistry B* 111[43], 12537-12542. 2007

**P 262- 07 "Opening up optical fibres"**

Cox, F. M., Lwin, R., Large, M. C. J., and Cordeiro, C. M. B.

A unique optical fibre design is presented in this work: a laterally accessible microstructured optical fibre, in which one of the cladding holes is open to the surrounding environment and the waveguide core exposed over long lengths of fibre. Such a fibre offers the opportunity of real-time chemical sensing and biosensing not previously possible with conventional microstructured optical fibres, as well as the ability to functionalize the core of the fibre without interference from the cladding. The fabrication of such a fibre using PMMA is presented, as well as experimental results demonstrating the use of the fibre as a evanescent wave absorption spectroscopy pH sensor using the indicator Bromothymol Blue. (C) 2007 Optical Society of America

*Optics Express* 15[19], 11843-11848. 2007.

**P 263- 07 "Optical packet header processing using time-to-wavelength mapping in semiconductor optical amplifiers"**

Teimoori, H., Topomondzo, J. D., Ware, C., and Erasme, D.

A new approach for optical packet header processing based on a time-to-wavelength converter is proposed. The processing is composed of transferring, through an all-optical AND-gate, the header data bits into the successive single optical pulses at different wavelengths. The AND-gate is performed by the semiconductor optical amplifier (SOA) and makes use of either cross-polarization modulation or four-wave mixing (FWM). Both implementations are compared. In order to improve the scalability of the design and to overcome the polarization sensitivity of the FWM solution, we propose the use of a spectrum-sliced incoherent light in generating the wavelength bits. The FWM process in this specific case is studied. The 10-Gb/s demonstrations of the various elements are presented

*Journal of Lightwave Technology* 25[8], 2149-2158. 2007.

**P 264- 07 "Phosphoric acid adsorbed on silica-ceria matrix obtained by sol-gel method: Studies of local structure, texture and acid property"**

Pissetti, F. L., Francisco, M. S. P., Landers, R., and Gushikem, Y.

SiO<sub>2</sub>/CeO<sub>2</sub> mixed oxide (designated as SC) with variable ceria contents, SC1 = 5.6, SC2 = 8.0 and SC3 = 13.0 wt%, prepared by the sol-gel processing method, were obtained as amorphous solids possessing specific surface areas of SC1 = 463, SC2 = 474 and SC3 = 460 m<sup>2</sup>/g(-1). Phosphate ions were immobilized onto the surface of these solids through Ce-O-P bonding by immersing SC into a phosphoric acid solution. Solids with the following P contents were obtained (in atom %): SCP1 = 0.60, SCP2 = 0.71 and SCP3 = 1.63. The binding energy peak P 2p(3/2) at ca. 134.0 eV, observed by XPS, and the P-31 MAS NMR single peak, observed at ca. -10 ppm, revealed that H<sub>2</sub>PO<sub>4</sub><sup>-</sup> is the species present on the surface of the matrices. Using pyridine as a molecular probe, only Bronsted acid sites could be detected. The amount of these acid sites, determined by ammonia gas adsorption on the surface, reached the following values for each phosphate-treated solid: SCP1 = 0.37, SCP2 = 0.43 and SCP3 = 0.51 mmol g(-1)

*Journal of the Brazilian Chemical Society* 18[5], 976-983. 2007.

**P 265- 07 "Physical properties of the Schur complement of local covariance matrices"**

Haruna, L. F. and de Oliveira, M. C.

General properties of global covariance matrices representing bipartite Gaussian states can be decomposed into properties of local covariance matrices and their Schur complements. We demonstrate that given a bipartite Gaussian state  $\rho(12)$  described by a 4 x 4 covariance matrix V, the Schur complement of a local covariance submatrix V-1 of it can be interpreted as a new covariance matrix representing a Gaussian operator of party 1 conditioned to local parity measurements on party 2. The connection with a partial parity measurement over a bipartite quantum state and the determination of the reduced Wigner function is given and an operational process of parity measurement is developed. Generalization of this procedure to an n-partite Gaussian state is given, and it is demonstrated that the n - 1 system state conditioned to a partial parity projection is given by a covariance matrix such that its 2 x 2 block elements are Schur complements of special local matrices

*Journal of Physics A-Mathematical and Theoretical* 40[47], 14195-14205. 2007.

**P 266- 07 "Pressure-temperature phase diagrams of in-plane doped CeRhIn5"**

Ferreira, L. M., Bittar, E. M., Pagliuso, P. G., Hering, E. N., Ramos, S. M., Borges, H. A., Baggio-Saitovich, E., Bauer, E. D., Thompson, J. D., and Sarrao, J. L.

In this work, we report a combined study about the effects of pressure and in-plane doping on the low temperature properties of AFM CeRhIn<sub>5</sub>. We have explored two different kinds of in-plane doping to perturb the AFM state of CeRhIn<sub>5</sub>. The La-doping in the Ce-site, which suppresses the AFM order simply by dilution and the Sn-doping in the In-sites, that suppresses the AFM order by increasing the Kondo-coupling. Electrical resistivity measurements under pressure were performed and the extracted pressure-temperature diagrams for these in-plane perturbed CeRhIn(5) single crystals are compared to the properties of the pure compound. (C) 2007 Elsevier B.V. All rights reserved

*Physica C-Superconductivity and Its Applications* 460, 672-673. 2007.

**P 267- 07 "Single- and few-walled carbon nanotubes grown at temperatures as low as 450 degrees C: Electrical and field emission characterization"**

Gohier, A., Djouadi, M. A., Dubosc, M., Granier, A., Minea, T. M., Sirghi, L., Rossi, F., Paredes, P., and Alvarez, F.

Single-wall (SW-) and few-walled (FW-) carbon nanotubes (CNTs) were synthesized on aluminum/cobalt coated silicon at temperatures as low as 450 degrees C by plasma enhanced chemical vapor deposition technique (PECVD). The SWCNTs and FWCNTs grow vertically oriented and well separated from each other. The cold field emission studies of as-grown SWCNTs and FWCNTs showed low turn-on field emission threshold voltages, strongly dependent of the nanotubes morphology. Current-voltage curves of individual CNTs, measured by conductive atomic force microscopy (CAFM), showed an electrical resistance of about 90 K Ohm, that is attributed mainly to the resistance of the contact between the CNTs and the conductive CAFM tip (Au and Pt)

*Journal of Nanoscience and Nanotechnology* 7[9], 3350-3353. 2007.

**P 268-07** "Statistical methods applied to composition studies of ultrahigh energy cosmic rays"

Catalani, F., Chinellato, J. A., de Souza, V., Takahashi, J., and Vasconcelos, G. M. S.

The mass composition of high energy cosmic rays above 10(17) eV is a crucial issue to solve some open questions in astrophysics such as the acceleration and propagation mechanisms. Unfortunately, the standard procedures to identify the primary particle of a cosmic ray shower have low efficiency mainly due to large fluctuations in the shower development. We present a statistical method for composition studies based on several measurable features of the longitudinal development of the CR shower such as N-max, X-max, asymmetry, skewness and kurtosis. Principal component analysis was used to evaluate the relevance of each parameter in the representation of the overall shower features and a linear discriminant analysis (LDA) was used to combine the different parameters to maximize the discrimination between different particle showers. LDA provides a separation between primary gammas, proton and iron nuclei better than the procedures based on X-max, only. The method proposed herein was successfully tested in the energy range from 10(17) to 10(20) eV even when 1 imitations of shower track length were included in order to simulate the field of view of fluorescence telescopes. (c) 2007 Elsevier B.V. All rights reserved

*Astroparticle Physics* 28[3], 357-365. 2007.

**P 269-07** "Structural characterization of ZnO/Er2O3 core/shell nanowires"

Mustafa, D., Biggemann, D., Wu, J., Coffey, J. L., and Tessler, L. R.

Zinc oxide/erbium oxide core/shell nanowires are of great potential value to optoelectronics because of the possible demonstration of laser emission in the 1.5  $\mu\text{m}$  range. In this paper we present a convenient technique to obtain structures of this composition. ZnO core nanowires were first obtained by a vapor-liquid-solid (VLS) method using gold as a catalyst. ZnO nanowires ranging from 50 to 100 nm in width were grown on the substrates. Erbium was incorporated into these nanowires by their exposure to Er(tmhd)(3) at elevated temperatures. After annealing at 700 degrees C in air, the nanowires presented 1.54  $\mu\text{m}$  emission when excited by any of the lines of an At+ laser. An investigation of nanowire structure by HRTEM indicates that indeed the cores consist of hexagonal ZnO grown in the 001 direction while the surface contains randomly oriented Er2O3 nanoparticles. EXAFS analysis reveals that the Er atoms possess a sixfold oxygen coordination environment, almost identical to that of Er2O3. Taken collectively, these data suggest that the overall architectures of these nanowires are discrete layered ZnO/Er2O3 core/shell structures whereby erbium atoms are not incorporated into the ZnO core geometry. (c) 2007 Elsevier Ltd. All rights reserved

*Superlattices and Microstructures* 42[1-6], 403-408. 2007.

**P 270-07** "Structure effects in the elastic scattering for the O-16+Ti-46,Ti-50 systems (vol 781, pg 342, 2007)"

Werner, J. C., Leal, L. A. S., Munhoz, M. G., Carlin, N., Chamon, L. C., Added, N., Brage, J. A. P., Neto, R. L., Coimbra, M. M., de Moura, M. M., Souza, F. A., Suaide, A. A. P., Szanto, E. M., de Toledo, A. S., and Takahashi, J.

*Nuclear Physics A* 794[3-4], 231-232. 2007.

**P 271-07** "Structure of potentials with N higgs doublets"

Nishi, C. C.

Extensions of the standard model with N Higgs doublets are simple extensions presenting a rich mathematical structure. An underlying Minkowski structure emerges from the study of both variable space and parameter space. The former can be completely parametrized in terms of two future lightlike Minkowski vectors with spatial parts forming an angle whose cosine is  $-(N-1)/(N+1)$ . For the parameter space, the Minkowski parametrization enables one to impose sufficient conditions for bounded below potentials, characterize certain classes of local minima, and distinguish charge breaking vacua from neutral vacua. A particular class of neutral minima presents a degenerate mass spectrum for the physical charged Higgs bosons

*Physical Review D* 76[5]. 2007.

**P 272-07** "Study of the superconducting and magnetic properties of niobium doped RuSr2Gd1.5Ce0.5Cu2O10-delta ruthenocuprates"

Cardoso, C. A., Araujo-Moreira, F. M., Awana, V. P. S., Kishan, H., and De Lima, O. F.

Polycrystalline samples of Ru1-xNbxSr2Gd1.5Ce0.5Cu2O10-delta,  $0 \leq x \leq 0.5$ , have been synthesized and studied by resistivity, magnetization and ac susceptibility measurements. It was identified a strong suppression of the spin glass (SG) transition, which was totally suppressed in samples for  $x \geq 0.2$ . The hysteresis loops at low temperatures are the result of the contribution of two distinct magnetic phases: a canted AFM phase and the SG phase. More importantly, the significant changes in the magnetic response of the material affect the superconducting properties of the samples. It was found that both T-c and the superconducting fraction are reduced in samples that show the spin glass phase, possibly due to the magnetic pair breaking effect. (C) 2007 Elsevier B.V. All rights reserved

*Physica C-Superconductivity and Its Applications* 460, 442-443. 2007.

**P 273-07** "The offline software framework of the Pierre Auger observatory"

Argiro, S., Barroso, S. L. C., Gonzalez, J., Nellen, L., Paul, T., Porter, T. A., Prado, L., Roth, M., Ulrich, R., and Veberic, D.

The Pierre Auger Observatory is designed to unveil the nature and the origins of the highest energy cosmic rays. The large and geographically dispersed collaboration of physicists and the wide-ranging collection of simulation and reconstruction tasks pose some special challenges for the offline analysis software. We have designed and implemented a general purpose framework which allows collaborators to contribute algorithms and sequencing instructions to build up the variety of applications they require. The framework includes machinery to manage these user codes, to organize the abundance of user-contributed configuration files, to facilitate multi-format file handling, and to provide access to event and time-dependent detector information which can reside in various data sources. A number of utilities are also provided, including a novel geometry package which allows manipulation of abstract geometrical objects independent of coordinate system choice. The framework is implemented in C++ and takes advantage of object oriented design and common open source tools, while keeping the user side simple enough for C++ novices to learn in a reasonable time. The distribution system incorporates unit and acceptance testing in order to support rapid development of both the core framework and contributed user code. (C) 2007 Elsevier B.V. All rights reserved

*Nuclear Instruments & Methods in Physics Research Section A-Accelerators Spectrometers Detectors and Associated Equipment* 580[3], 1485-1496. 2007.

**P 274-07** "Theory of neutrinos: a white paper"

Mohapatra, R. N., Antusch, S., Babu, K. S., Barenboim, G., Chen, M. C., de Gouvea, A., de Holanda, P., Dutta, B., Grossman, Y., Joshipura, A., Kayser, B., Kersten, J., Keum, Y. Y., King, S. F., Langacker, P., Lindner, M., Loinaz, W., Masina, I., Mocioiu, I., Mohanty, S., Murayama, H., Pascoli, S., Petcov, S. T., Pilaftsis, A., Ramond, P., Ratz, M., Rodejohann, W., Shrock, R., Takeuchi, T., Underwood, T., and Wolfenstein, L.

This paper is a review of the present status of neutrino mass physics, which grew out of an APS sponsored study of neutrinos in 2004. After a discussion of the present knowledge of neutrino masses and mixing and some popular ways to probe the new physics implied by recent data, it summarizes what can be learned about neutrino interactions as well as the nature of new physics beyond the Standard Model from the various proposed neutrino experiments. The intriguing possibility that neutrino mass physics may be at the heart of our understanding of a long standing puzzle of cosmology, i.e. the origin of matter-antimatter asymmetry is also discussed

*Reports on Progress in Physics* 70[11], 1757-1867. 2007.

**P 275-07 "Tool steel ion beam assisted nitrocarburization"**

Zagonel, L. F. and Alvarez, F.

The nitrocarburization of the AISI-H13 tool steel by ion beam assisted deposition is reported. In this technique, a carbon film is continuously deposited over the sample by the ion beam sputtering of a carbon target while a second ion source is used to bombard the sample with low energy nitrogen ions. The results show that the presence of carbon has an important impact on the crystalline and microstructural properties of the material without modification of the case depth. (C) 2007 Elsevier B.V. All rights reserved

*Materials Science and Engineering A-Structural Materials Properties Microstructure and Processing* 465[1-2], 194-198. 2007.

**P 276-07 "Towards practical liquid and gas sensing with photonic crystal fibres: side access to the fibre microstructure and single-mode liquid-core fibre"**

Cordeiro, C. M. B., de Matos, C. J. S., dos Santos, E. M., Bozolan, A., Ong, J. S. K., Facincani, T., Chesini, G., Vaz, A. R., and Cruz, C. H. B.

Photonic crystal fibres (PCFs) have important applications in sensing the optical properties of fluids. To this end, the material should be inserted into the fibre holes in order to interact with the propagating field. When dealing with liquids, it is particularly interesting to exclusively insert the sample into the core of a hollow-core PCF, which then guides light through the liquid via total internal reflection. Nevertheless, there is still a series of issues to be addressed before fluid sensing with PCFs becomes practical. The work described here proposes and demonstrates possible solutions for two of these issues: (a) how to insert the sample through a lateral access to the fibre longitudinal holes so that the fibre tips are free for optical handling and accessing and (b) in the case of a liquid-core PCF, how to reduce the number of propagating modes

*Measurement Science & Technology* 18[10], 3075-3081. 2007.

**P 277-07 "WO<sub>3</sub> pillar-type and helical-type thin film structures to be used in microbatteries"**

Figueroa, R., Cruz, T. G. S., and Gorenstein, A.

In the present study WO<sub>3</sub> thin films were deposited by sputtering onto ITO glass, W/ITO and Si substrates by using the glancing angle deposition (GLAD) technique, with the objective of applying these materials in electrochemical intercalation devices. The thin films microstructure and electrochemical behavior were determined through scanning electron microscopy (SEM) and cycling at constant current with potential limitation. By mainly adjusting the substrate holder speed rotation, pillar-type and helical-type structures were obtained under high and low speed rotation levels, respectively. The electrochemical results showed that the best charge capacity performance was obtained for the WO<sub>3</sub>/W/ITO films with pillar-type structures, which are more porous. (C) 2007 Elsevier B.V. All rights reserved

*Journal of Power Sources* 172[1], 422-427. 2007.

## TRABALHO ACEITO PARA PUBLICAÇÃO

**A 011-07 Size Limit to Defect Formation in Pyramidal Pt Nanocontacts**

V. Rodrigues, F. Sato, D. S. Galvão and D. Ugarte

We report high resolution transmission electron microscopy and ab initio calculation results for defect formation in sharp pyramidal Pt nanocontacts. Our results show that there is a size limit to the existence of twins (extended structural defects). These defects are always present but blocked away from the tip axes. They may act as scattering planes, influencing the electron conductance for Pt nanocontacts at room temperature and Ag/Au nanocontacts at low temperature (< 150 K).

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## Abstracta

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