

# Abstracta

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Trabalhos Publicados

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P208-10 à P242 -10

## Trabalhos Publicados

[P208-10] "A comprehensive study of the influence of the stoichiometry on the physical properties of TiOx films prepared by ion beam deposition"

Marchi, M. C., Bilmes, S. A., Ribeiro, C. T. M., Ochoa, E. A., Kleinke, M., and Alvarez, F.

A comprehensive study of nonstoichiometry titanium oxide thin films (TiO<sub>x</sub>, 0.3 ≤ x ≤ 2) prepared by ion beam deposition technique is reported. The physical properties of the material are studied by ultraviolet and x-ray photoelectron, Raman, and Fourier transform infrared spectroscopies, and atomic force microscopy. An abrupt transition from metallic characteristics to a wide gap semiconductor is observed in a very narrow range of oxygen variation. Concomitantly with this change the crystal structure and morphology suffer remarkable physical properties modifications. This transformation is ascribed to surface-volume energy minimization due to the influence of oxygen determining the size of the TiO<sub>2</sub> particles during coalescence. (C) 2010 American Institute of Physics. [doi: 10.1063/1.3481442]

Journal of Applied Physics 108[6]. 064912. 2010.

[P209-10] "A Glance at the World"

Lino, F. A. M., Bizzo, W. A., Ismail, K. A. R., and da Silva, E. P.

Waste Management 30[10], 2007-2008. 2010.

[P210-10] "Atomistic simulation of track formation by energetic recoils in zircon"

Moreira, P. A. F. P., Devanathan, R., and Weber, W. J.

We have performed classical molecular dynamics simulations of fission track formation in zircon. We simulated the passage of a swift heavy ion through crystalline zircon using cylindrical thermal spikes with energy deposition (dE/dx) of 2.5-12.8 keV nm<sup>-1</sup> and a radius of 3 nm. At a low dE/dx of 2.55 keV nm<sup>-1</sup>, the structural damage recovered almost completely and a damage track was not produced. At higher values of dE/dx, tracks were observed and the radius of the track increased with increasing dE/dx. Our structural analysis shows amorphization in the core of the track and phase separation into Si-rich regions near the center of the track and Zr-rich regions near the periphery. These simulations establish a threshold dE/dx for fission track formation in zircon that is relevant to thermochronology and nuclear waste immobilization

Journal of Physics-Condensed Matter 22[39].395008.2010.

[P211-10] "Biodegradable submicrometric sieves in PLLA fabricated by soft lithography"

Gutierrez-Rivera, L. and Cescato, L.

Sieves are membranes with a regular array of uniform pores that present low flow resistance. Because of such characteristics they are promising devices for filtration, separation of particles by size and drug delivery control systems. In this paper, we propose and demonstrated the use of a soft lithography process for fabrication of biodegradable sieves in PLLA (poly-L-lactide) with pores in the scale of hundred of nanometers. The fabrication process is suitable for mass production and submicrometric pore diameters can be fabricated with homogeneity of about 15%. The PLLA self sustained sieve can be integrated to PLLA capsules, compounding a drug delivery systems or implants

Microsystem Technologies-Micro-and Nanosystems-Information Storage and Processing Systems 16[11], 1893-1899. 2010.

[P212-10] "Carbon nanotube with square cross-section: An ab initio investigation"

Autreto, P. A. S., Legoas, S. B., Flores, M. Z. S., and Galvao, D. S.

Recently, Lagos et al. [Nat. Nanotechnol. 4, 149 (2009)] reported the discovery of the smallest possible silver square cross-section nanotube. A natural question is whether similar carbon nanotubes can exist. In this work we report ab initio results for the structural, stability, and electronic properties for such hypothetical structures. Our results show that stable (or at least metastable) structures are possible with metallic properties. They also show that these structures can be obtained by a direct interconversion from SWNT (2,2). Large finite cubanelike oligomers, topologically related to these new tubes, were also investigated. (C) 2010 American Institute of Physics. [doi: 10.1063/1.3483237]

Journal of Chemical Physics 133[12].124513.2010.

[P213-10] "Clusters in intense FLASH pulses: ultrafast ionization dynamics and electron emission studied with spectroscopic and scattering techniques"

Bostedt, C., Adolph, M., Eremina, E., Hoener, M., Rupp, D., Schorb, S., Thomas, H., de Castro, A. R. B., and Moller, T.

FLASH, the first FEL operating at short wavelength, has paved the way for novel types of experiments in many different scientific disciplines. Key questions for the first experiments with this new type of light source are linked to light-matter interaction and ionization processes. This paper gives an overview of the ultrafast ionization dynamics and electron emission of pure and doped rare gas clusters illuminated with intense short-wavelength pulses by summarizing the findings of recent years' work at FLASH. Atomic clusters are ideal for investigating the light-matter interaction because their size can be tuned from the molecular to the bulk regime, thus allowing us to distinguish between intra and interatomic processes. The ionization processes turned out to be strongly wavelength dependent. Plasma absorption, while dominant at 13 eV, becomes insignificant at photon energies above 40 eV. The cluster ionization and disintegration proceed in several steps on a time scale from fs to ps. Insight into the involved processes can be obtained with ion and electron spectroscopy. The high intensity of FLASH pulses opens the door for a new imaging approach to study nanoparticles. Scattering patterns of single and few clusters can be recorded in a single shot. Initial results of scattering experiments and their comparison to Mie calculations show that two- and three-dimensional structural information of gas phase particles can be obtained this way

Journal of Physics B-Atomic Molecular and Optical Physics 43[19].194011.2010.

[P214-10] "Computerized texture analysis of human aorta by co-localization of collagen and elastic fibers with a multi-photon-microscope"

Vieira, G., Ferro, D. P., Adam, R. L., Thomaz, A. A., Cesar, L. C., and Metzke, K.

Histopathology 57, 533. 2010.

**[P215-10] "Determination of the entropy change using the acoustic detection technique in the investigation of the magnetocaloric effect"**

Soffner, M. E., Mansanares, A. M., Gandra, F. C. G., Coelho, A. A., Gama, S., Carvalho, A. M. G., Pires, M. J. M., Guimaraes, A. O., and da Silva, E. C.

In this paper we demonstrate the use of the acoustic detection as an alternative way to determine the entropy variation,  $\Delta S-T$ , a parameter normally used to characterize the magnetocaloric effect. The measurements were performed for a Gd sample in the 252-316 K temperature range for magnetic fields from zero up to 50 kOe. The reversible adiabatic curves were built in a T versus H diagram, and specific heat data obtained at zero-magnetic field were employed to assign the entropy values of each curve. Subsequently, the entropy was plotted as a function of temperature for fixed magnetic fields, and therefore the isothermal entropy variation,  $\Delta S-T$ , was found as a function of the temperature for several magnetic field steps

*Journal of Physics D-Applied Physics* 43[44].445002.2010.

**[P216-10] "Effect of TiO<sub>2</sub> nanoparticles on the thermal properties of decorated multiwall carbon nanotubes: A Raman investigation"**

de Zevallos-Marquez, A. M. O., Brasil, M. J. S. P., Iikawa, F., Abbaspourrad, A., Verissimo, C., Moshkalev, S. A., and Alves, O. L.

We have investigated multiwalled carbon nanotubes decorated with TiO<sub>2</sub> nanoparticles. Scanning electron microscopy and transmission electron microscopy measurements revealed that the TiO<sub>2</sub> incorporates on the nanotubes forming large cauliflowerlike aggregates and/or small crystalline particles attached to the nanotube wall, depending on the growth conditions. A detailed Raman study was performed in pristine and a series of decorated nanotubes, where we analyzed both the Raman signal from the nanotubes and from the TiO<sub>2</sub> nanoparticles. We demonstrate that the attached TiO<sub>2</sub> nanoparticles affect significantly the thermal properties of the resulting hybrid nanostructure, as revealed by differentiated reactions to laser heating. This is a crucial point for modeling and optimization of devices based on nanotubes, which properties are strongly temperature dependent. (C) 2010 American Institute of Physics. [doi: 10.1063/1.3496671]

*Journal of Applied Physics* 108[8].083501.2010.

**[P217-10] "Efficient calculation of higher-order optical waveguide dispersion"**

Mores, J. A., Malheiros-Silveira, G. N., Fragnito, H. L., and Hernandez-Figueroa, H. E.

An efficient numerical strategy to compute the higher-order dispersion parameters of optical waveguides is presented. For the first time to our knowledge, a systematic study of the errors involved in the higher-order dispersions' numerical calculation process is made, showing that the present strategy can accurately model those parameters. Such strategy combines a full-vectorial finite element modal solver and a proper finite difference differentiation algorithm. Its performance has been carefully assessed through the analysis of several key geometries. In addition, the optimization of those higher-order dispersion parameters can also be carried out by coupling to the present scheme a genetic algorithm, as shown here through the design of a photonic crystal fiber suitable for parametric amplification applications. (C) 2010 Optical Society of America

*Optics Express* 18[19], 19522-1U123. 2010.

**[P218-10] "EPR of gamma-induced paramagnetic centers in tellurite glasses"**

Giehl, J. M., Pontuschka, W. M., Barbosa, L. C., and Ludwig, Z. M. C.

Intrinsic paramagnetic responses were observed in the 60TeO(2)-25ZnO-15Na(2)O and 85TeO(2)-15Na(2)O mol% glasses, after gamma-irradiation at room temperature: (1) a shoulder at  $g(1) = g(\text{parallel to}) = 2.02 \pm 0.01$  and an estimated  $g(\text{perpendicular to})$  similar to 2.0 attributed to tellurium-oxygen hole center (TeOHC); (2) a narrow resonance at  $g(2) = 1.9960 \pm 0.0005$  related to the modifiers and (3) a resolved resonance at  $g(3) = 1.9700 \pm 0.0005$  ascribed to a tellurium electron center (TeEC) of an electron trapped at an oxygen vacancy (V-o(+)) in a tellurium oxide structural center. It is suggested that the creation of (NBO-,V-o(+)) pair follows a mechanism where the modifier oxide molecule actuates as a catalyser. An additional model for the NBO radiolysis produced by the gamma-irradiation is proposed on the basis of the evolution of the  $g(1)$ ,  $g(2)$  and  $g(3)$  intensities with increasing dose (kGy). Crown Copyright (C) 2010 Published by Elsevier B.V. All rights reserved

*Journal of Non-Crystalline Solids* 356[35-36], 1762-1767. 2010.

**[P219-10] "Fabrication and electrical performance of high-density arrays of nanometric silicon tips"**

Carvalho, E. J., Alves, M. A. R., Braga, E. S., and Cescato, L.

We propose and demonstrate a simple and low cost process for the fabrication of large area arrays of nanometric silicon tips, for use as Field Emission Devices (FEDs). The process combines Interference Lithography (IL) with isotropic Reactive Ion Etching (RIE). Si tips with typical curvature radius of 20 nm and height of 900 nm were recorded with a periodicity of 1  $\mu$ m (density of 10(6) tips/mm(2)) covering a Silicon wafer of 2 in. The measurement of the electrical performance of the arrays demonstrates the feasibility of the association of these two techniques for recording Field Emission Tips. (C) 2010 Elsevier B.V. All rights reserved

*Microelectronic Engineering* 87[12], 2544-2548. 2010.

**[P220-10] "High temperature emissivity, reflectivity, and x-ray absorption of BiFeO<sub>3</sub>"**

Massa, N. E., del Campo, L., Meneses, D. D., Echegut, P., Fabbris, G. F. L., Azevedo, G. D., Martinez-Lope, M. J., and Alonso, J. A.

We report on the lattice evolution of BiFeO<sub>3</sub> as function of temperature using far infrared emissivity, reflectivity, and x-ray absorption local structure. A power law fit to the lowest frequency soft phonon in the magnetic ordered phase yields an exponent  $\beta=0.25$  as for a tricritical point. At about 200 K below T-N similar to 640 K it ceases softening as consequence of BiFeO<sub>3</sub> metastability. We identified this temperature as corresponding to a crossover transition to an order-disorder regime. Above similar to 700 K strong band overlapping, merging, and smearing of modes are consequence of thermal fluctuations and chemical disorder. Vibrational modes show band splits in the ferroelectric phase as emerging from triple degenerated species as from a paraelectric cubic phase above T-C similar to 1090 K. Temperature dependent x-ray absorption near edge structure (XANES) at the Fe K edge shows that lower temperature Fe<sup>3+</sup> turns into Fe<sup>2+</sup>. While this matches the FeO wustite XANES profile, the Bi L-III-edge downshift suggests a high temperature very complex bond configuration at the distorted A perovskite site. Overall, our local structural measurements reveal high temperature defect-induced



irreversible lattice changes, below, and above the ferroelectric transition, in an environment lacking of long-range coherence. We did not find an insulator to metal transition prior to melting. (C) 2010 American Institute of Physics. [doi:10.1063/1.3486515]

**Journal of Applied Physics 108[8].084114.2010.**

**[P221-10] “Home range evolution and its implication in population outbreaks”**

Araujo, S. B. L., Viswanathan, G. M., and de Aguiar, M. A. M.

We investigated the phenomenon of population outbreaks in a spatial predator-prey model, and we found that pattern formation and outbreaks occur if the predators have a limited neighbourhood of interaction with the preys. The outbreaks can display a scale-invariant power-law tail, indicating self-organized criticality. We have also studied the system from an evolutionary point of view, where the predator home range is a hereditary trait subjected to mutations. We found that mutation drives the predator home range area to an optimal value where pattern formation and outbreaks are still present, but the latter are much less frequent. We developed analytical approximations using mean field and pair correlation techniques that indicate that the predation strategy is crucial for existence of this optimal home range area

**Philosophical Transactions of the Royal Society A-Mathematical Physical and Engineering Sciences 368[1933], 5661-5677. 2010.**

**[P222-10] “Inhomogeneous free-electron distribution in InN nanowires: Photoluminescence excitation experiments”**

Segura-Ruiz, J., Molina-Sanchez, A., Garro, N., Garcia-Cristobal, A., Cantarero, A., Iikawa, F., Denker, C., Malindretos, J., and Rizzi, A.

Photoluminescence excitation (PLE) spectra have been measured for a set of self-assembled InN nanowires (NWs) and a high-crystalline quality InN layer grown by molecular-beam epitaxy. The PLE experimental lineshapes have been reproduced by a self-consistent calculation of the absorption in a cylindrical InN NW. The differences in the PLE spectra can be accounted for the inhomogeneous electron distribution within the NWs caused by a bulk donor concentration (N-D(+)) and a two-dimensional density of ionized surface states (N-ss(+)). For NW radii larger than 30 nm, N-D(+) and N-ss(+) modify the absorption edge and the lineshape, respectively, and can be determined from the comparison with the experimental data

**Physical Review B 82[12].125319.2010.**

**[P223-10] “Measurement of the Bottom Quark Contribution to Nonphotonic Electron Production in p plus p Collisions at root s=200 GeV”**

Aggarwal, M. M., Ahammed, Z., Alakhverdyants, A. V., Alekseev, I., Alford, J., Anderson, B. D., Anson, D., et al

The contribution of B meson decays to nonphotonic electrons, which are mainly produced by the semileptonic decays of heavy-flavor mesons, in p + p collisions at root s = 200 GeV has been measured using azimuthal correlations between nonphotonic electrons and hadrons. The extracted B decay contribution is approximately 50% at a transverse momentum of  $p(T) \geq 5$  GeV/c. These measurements constrain the nuclear modification factor for electrons from B and D meson decays. The result indicates that B meson production in heavy ion collisions is also suppressed at high  $p(T)$

**Physical Review Letters 105[20]. 202301.2010.**

**[P224-10] “Mechanochemistry in Cu nanowires: N and N-2 enhancing the atomic chain formation”**

Amorim, E. P. M. and da Silva, E. Z.

We show using ab initio total-energy calculations based on density-functional theory how H, B, C, N, O, S, and N-2 impurities incorporated to thin copper nanowires could affect their mechanical properties and electronic structure. An interesting mechanochemical effect arises from the insertion of N and N-2 in the linear atomic chain. These impurities form not only stable but also very strong p-d bonds, in such a way that they can extract atoms from a stable tip enhancing the atomic chain suggesting the possibility to pull a string of copper atoms through the production of copper nanowires in nitrogen atmospheres

**Physical Review B 82[15].153403.2010.**

**[P225-10] “Negative c-axis magnetoresistance in graphite”**

Kopelevich, Y., da Silva, R. R., Pantoja, J. C. M., and Bratkovsky, A. M.

We have studied the c-axis interlayer magnetoresistance (ILMR),  $R_c(B)$  in graphite. The measurements have been performed on strongly anisotropic highly oriented pyrolytic graphite (HOPG) and single crystalline Kish graphite samples in magnetic field up to  $B = 9$  T, and the temperature interval  $2$  K  $\leq T \leq 300$  K. We have observed negative magnetoresistance,  $dR_c/dB < 0$ , for B parallel to c-axis for both samples above a certain field  $B_m(T) > 5.4$  T and 0.2 T for HOPG and Kish graphite, respectively. The results can be understood consistently by assuming that ILMR is related to a tunneling between zero-energy Landau levels of quasi-two-dimensional Dirac fermions, in a close analogy with the behavior reported for  $\alpha$ -(BEDT-TIT)(2)I-3 [N. Tajima, et al., Phys. Rev. Lett. 102 (2009) 176403], another multilayer Dirac electron system. (C) 2010 Elsevier B.V. All rights reserved

**Physics Letters A 374[45], 4629-4632. 2010.**

**[P226-10] “New constraints on muon-neutrino to electron-neutrino transitions in MINOS”**

Adamson, P., Andreopoulos, C., Auty, D. J., Ayres, D. S., Backhouse, C., Barr, G., Bernstein, R. H., Betancourt, M., et al

This paper reports results from a search for  $\nu(\mu) \rightarrow \nu(e)$  transitions by the MINOS experiment based on a  $7 \times 10^{20}$  protons-on-target exposure. Our observation of 54 candidate  $\nu(e)$  events in the far detector with a background of  $49.1 \pm 7.0$  (stat)  $\pm 2.7$  (syst) events predicted by the measurements in the near detector requires  $2 \sin^2(2\theta_{13}) \sin^2(\theta_{23}) < 0.12$  (0.20) at the 90% C.L. for the normal (inverted) mass hierarchy at  $\Delta(CP) = 0$ . The experiment sets the tightest limits to date on the value of  $\theta_{13}$  for nearly all values of  $\Delta(CP)$  for the normal neutrino mass hierarchy and maximal  $\sin^2(2\theta_{23})$

**Physical Review D 82[5].051102.2010.**

**[P227-10] “Nonequilibrium Bose-Einstein condensation of hot magnons”**

Vannucchi, F. S., Vasconcellos, A. R., and Luzzi, R.

We present an analysis of the emergence of a nonequilibrium Bose-Einstein-type condensation of magnons in radio-frequency

pumped magnetic thin films, which has recently been experimentally observed. A complete description of all the nonequilibrium processes involved is given. It is demonstrated that the phenomenon is another example of the emergence of Bose-Einstein-type condensation in nonequilibrium many-boson systems embedded in a thermal bath, a phenomenon evidenced decades ago by the renowned late Herbert Frohlich

**Physical Review B 82[14].140404.2010.**

**[P228-10] “Parton energy loss in heavy-ion collisions via direct-photon and charged-particle azimuthal correlations”**

Abelev, B. I., Aggarwal, M. M., Ahammed, Z., Alakhverdyants, A. V., Anderson, B. D., Arkhipkin, D., Averichev, G. S., Balewski, J., Barannikova, O., Barnby, L. S., Baudot, J., Baumgart, S., et al

Charged-particle spectra associated with direct photon ( $\gamma(\text{dir})$ ) and  $\pi(0)$  are measured in  $p + p$  and  $\text{Au} + \text{Au}$  collisions at center-of-mass energy  $\sqrt{s}(\text{NN}) = 200 \text{ GeV}$  with the STAR detector at the Relativistic Heavy Ion Collider. A shower-shape analysis is used to partially discriminate between  $\gamma(\text{dir})$  and  $\pi(0)$ . Assuming no associated charged particles in the  $\gamma(\text{dir})$  direction (near side) and small contribution from fragmentation photons ( $\gamma(\text{frag})$ ), the associated charged-particle yields opposite to  $\gamma(\text{dir})$  (away side) are extracted. In central  $\text{Au} + \text{Au}$  collisions, the charged-particle yields at midrapidity (vertical bar  $\eta$  vertical bar  $< 1$ ) and high transverse momentum ( $3 < \text{assoc}(\text{PT}) < 16 \text{ GeV}/c$ ) associated with  $\gamma(\text{dir})$  and  $\pi(0)$  (vertical bar  $\eta$  vertical bar  $< 0.9$ ,  $8 < \text{trig}(\text{PT}) < 16 \text{ GeV}/c$ ) are suppressed by a factor of 3-5 compared with  $p + p$  collisions. The observed suppression of the associated charged particles is similar for  $\gamma(\text{dir})$  and  $\pi(0)$  and independent of the  $\gamma(\text{dir})$  energy within uncertainties. These measurements indicate that, in the kinematic range covered and within our current experimental uncertainties, the parton energy loss shows no sensitivity to the parton initial energy, path length, or color charge

**Physical Review C 82[3].034909.2010.**

**[P229-10] Probing the quantum phase transition in the Dicke model through mechanical vibrations**

K. Furuya, F. L. Semião and J. P. Santos

This paper is concerned with quantum dynamics of a system coupled to a critical reservoir. In this context, we employ the Dicke model which is known to exhibit a superradiant quantum phase transition (QPT) and we allow one of the mirrors to move under a linear restoring force. The electromagnetic field couples to the movable mirror through radiation pressure just like in typical optomechanical setups. We show that, in the thermodynamical limit, the superradiant phase induces a classical driving force on the mirror without causing decoherence.

**PHYSICAL REVIEW A 82, 063801 (2010)**

**[P230-10] “Quantum dissipation in vacuum neutrino oscillation”**

Oliveira, R. L. N. and Guzzo, M. M.

The pattern of neutrino oscillations changes when one considers these particles evolving as an open quantum system. In this article we derive seven possibilities that change the two-generation neutrino survival probability due to quantum dissipation and decoherence. We find entirely original probabilities assuming that these effects can be parametrized by the addition of only one phenomenological constant keeping complete positivity. We observe that a relaxation effect of the system shows an unusual mechanism

of flavor conversion, the appearance of CP-violation effects for Majorana neutrinos, besides an appreciable change in the behavior of high energy neutrinos

**European Physical Journal C 69[3-4], 493-502. 2010.**

**[P231-10] “Search for Lorentz Invariance and CPT Violation with the MINOS Far Detector”**

Adamson, P., Auty, D. J., Ayres, D. S., Backhouse, C., Barr, G., Barrett, W. L., Bishai, M., Blake, A., Bock, G. J., Boehnlein, D. J., Bogert, D., Bower, C., Budd, S., Cavanaugh, S., et al

We searched for a sidereal modulation in the MINOS far detector neutrino rate. Such a signal would be a consequence of Lorentz and CPT violation as described by the standard-model extension framework. It also would be the first detection of a perturbative effect to conventional neutrino mass oscillations. We found no evidence for this sidereal signature, and the upper limits placed on the magnitudes of the Lorentz and CPT violating coefficients describing the theory are an improvement by factors of 20-510 over the current best limits found by using the MINOS near detector

**Physical Review Letters 105[15].151601.2010.**

**[P232-10] “Structural modeling of high-affinity thyroid receptor-ligand complexes”**

de Araujo, A. S., Martinez, L., Nicoluci, R. D., Skaf, M. S., and Polikarpov, I.

Understanding the molecular basis of the binding modes of natural and synthetic ligands to nuclear receptors is fundamental to our comprehension of the activation mechanism of this important class of hormone regulated transcription factors and to the development of new ligands. Thyroid hormone receptors (TR) are particularly important targets for pharmaceuticals development because TRs are associated with the regulation of metabolic rates, body weight, and circulating levels of cholesterol and triglycerides in humans. While several high-affinity ligands are known, structural information is only partially available. In this work we obtain structural models of several TR-ligand complexes with unknown structure by docking high affinity ligands to the receptors' ligand binding domain with subsequent relaxation by molecular dynamics simulations. The binding modes of these ligands are discussed providing novel insights into the development of TR ligands. The experimental binding free energies are reasonably well-reproduced from the proposed models using a simple linear interaction energy free-energy calculation scheme

**European Biophysics Journal with Biophysics Letters 39[11], 1523-1536. 2010.**

**[P233-10] “Superconducting Quantum Critical Point in  $\text{CeCoIn}_5$ - $x\text{Sn}_x$ ”**

Ramos, S. M., Fontes, M. B., Hering, E. N., Continentino, M. A., Baggio-Saitovich, E., Neto, F. D., Bittar, E. M., Pagliuso, P. G., Bauer, E. D., Sarrao, J. L., and Thompson, J. D.

We report a combined pressure-doping study in the nearly two-dimensional heavy fermion superconductor  $\text{CeCoIn}_5$  as its superconducting phase is driven to the normal state by Sn doping and/or applied pressure. Temperature-pressure-dependent electrical resistivity measurements were performed at the vicinity of a superconducting quantum critical point where  $T_c \rightarrow 0$ . A universal plot of the concentration- and pressure-dependent phase diagram suggests that for the concentrations studied a single mechanism is responsible for reducing  $T_c$  and bringing

the system to the superconducting quantum critical point. A two-band model with hybridization controlled by pressure and doping provides a consistent description of the phase diagram and the suppression of the d-wave superconductivity in this material

**Physical Review Letters 105[12].126401.2010.**

**[P234-10] “Surface spin disorder effects in magnetite and poly(thiophene)-coated magnetite nanoparticles”**

Cotica, L. F., Santos, I. A., Giroto, E. M., Ferri, E. V., and Coelho, A. A.

Chemically synthesized magnetite and poly(thiophene)-coated magnetite nanoparticles and the correlations between their magnetic, structural, and microstructural properties are investigated. A typical superparamagnetic behavior was observed for faceted nanoparticle agglomerates of magnetite and nanocomposite. In nanocomposites, the polymer layer causes a sharp decrease in the spin disorder, which reduces the anisotropy constant significantly. This happens because the intimate contact between magnetite and poly(thiophene) leads to charge transfer from the polymer to the core via polaron interactions, causing a structural rearrangement of the nanoparticles and suppression of the spin movement at the surface. As this dynamic interaction can tune the core dimensions, the magnetic properties of nanocomposites can be tuned by controlling the core size through polymer coating. These characteristics can be exploited to design high-performance magnetically tunable nanodevices and applied in many areas of biomedicine (DNA separation, drug targeting, immune detection, and magnetic nanoparticle hyperthermia in cancer treatment). (C) 2010 American Institute of Physics. [doi:10.1063/1.3488634]

**Journal of Applied Physics 108[6].064325.2010.**

**[P235-10] “Temperature effects on the atomic arrangement and conductance of atomic-size gold nanowires generated by mechanical stretching”**

Lagos, M. J., Sato, F., Autreto, P. A. S., Galvao, D. S., Rodrigues, V., and Ugarte, D.

We have studied the changes induced by thermal effects in the structural and transport response of Au nanowires generated by mechanical elongation. We have used time-resolved atomic resolution transmission electron microscopy imaging and quantum conductance measurement using a mechanically controllable break junction. Our results showed remarkable differences in the NW evolution for experiments realized at 150 and 300 K, which modifies drastically the conductance response during elongation. Molecular dynamics and electronic transport calculations were used to consistently correlate the observed structural and conductance behavior. These results emphasize that it is essential to take into account the precise atomic arrangement of nanocontacts generated by mechanical stretching to understand electrical transport properties. Also, our study shows that much care must be taken when comparing results obtained in different experimental conditions, mainly different temperatures

**Nanotechnology 21[48].485702.2010.**

**[P236-10] “The role of predator overlap in the robustness and extinction of a four species predator-prey network”**

Hisi, A. N. S., Guimaraes, P. R., and de Aguiar, M. A. M.

Predators and preys often form species networks with asymmetric patterns of interaction. We study the dynamics of

a four species network consisting of two weakly connected predator-prey pairs. We focus our analysis on the effects of the cross interaction between the predator of the first pair and the prey of the second pair. This is an example where the predator overlap, which is the proportion of predators that a given prey shares with other preys, is not uniform across the network due to asymmetries in patterns of interaction. We explore the behavior of the system under different interaction strengths and study the dynamics of survival and extinction. In particular, we consider situations in which the four species have initial populations lower than their long-term equilibrium, simulating catastrophic situations in which their abundances are reduced due to human action or environmental change. We show that, under these reduced initial conditions, and depending on the strength of the cross interaction, the populations tend to oscillate before re-equilibrating, disturbing the community equilibrium and sometimes reaching values that are only a small fraction of the equilibrium population, potentially leading to their extinction. We predict that, contrary to one's intuition, the most likely scenario is the extinction of the less predated preys. (C) 2010 Elsevier B.V. All rights reserved

**Physica A-Statistical Mechanics and Its Applications 389[21], 4725-4733. 2010.**

**[P237-10] “Three-site Bose-Hubbard model subject to atom losses: Boson-pair dissipation channel and failure of the mean-field approach”**

Shchesnovich, V. S. and Mogilevtsev, D. S.

We employ the perturbation series expansion for derivation of the reduced master equations for the three-site Bose-Hubbard model subject to strong atom losses from the central site. The model describes a condensate trapped in a triple-well potential subject to externally controlled removal of atoms. We find that the pi-phase state of the coherent superposition between the side wells decays via two dissipation channels, the single-boson channel (similar to the externally applied dissipation) and the boson-pair channel. The quantum derivation is compared to the classical adiabatic elimination within the mean-field approximation. We find that the boson-pair dissipation channel is not captured by the mean-field model, whereas the single-boson channel is described by it. Moreover, there is a matching condition between the zero-point energy bias of the side wells and the nonlinear interaction parameter which separates the regions where either the single-boson or the boson-pair dissipation channel dominate. Our results indicate that the M-site Bose-Hubbard models, for  $M > 2$ , subject to atom losses may require an analysis which goes beyond the usual mean-field approximation for correct description of their dissipative features. This is an important result in view of the recent experimental works on the single-site addressability of condensates trapped in optical lattices

**Physical Review A 82[4].043621.2010.**

**[P238-10] “Transverse momentum spectra of charged particles in proton-proton collisions at root s=900 GeV with ALICE at the LHC”**

Aamodt, K., Abel, N., Abeyssekara, U., Quintana, A. A., Abramyan, A., Adamova, D., Aggarwal, M. M., Rinella, G. A., et al

The inclusive charged particle transverse momentum distribution is measured in proton-proton collisions at root s = 900 GeV at the LHC using the ALICE detector. The measurement is performed in the central pseudorapidity region (vertical bar eta vertical bar < 0.8) over the transverse momentum range  $0.15 < p(T) < 10$  GeV/c. The correlation between transverse momentum and particle multiplicity is also studied. Results are



presented for inelastic (INEL) and non-single-diffractive (NSD) events. The average transverse momentum for vertical bar eta vertical bar < 0.8 is  $\langle p(T) \rangle (\text{INEL}) = 0.483 \pm 0.001 (\text{stat.}) \pm 0.007 (\text{syst.}) \text{ GeV}/c$  and  $\langle p(T) \rangle (\text{NSD}) = 0.489 \pm 0.001 (\text{stat.}) \pm 0.007 (\text{syst.}) \text{ GeV}/c$ , respectively. The data exhibit a slightly larger  $\langle p(T) \rangle$  than measurements in wider pseudorapidity intervals. The results are compared to simulations with the Monte Carlo event generators PYTHIA and PHOJET. (C) 2010 Published by Elsevier B.V

**Physics Letters B 693[2], 53-68. 2010.**

**[P239-10] “Tunable resonances due to vacancies in graphene nanoribbons”**

Bahamon, D. A., Pereira, A. L. C., and Schulz, P. A.

The coherent electron transport along zigzag and metallic armchair graphene nanoribbons in the presence of one or two vacancies is investigated. Having in mind atomic scale tunability of the conductance fingerprints, the primary focus is on the effect of the distance to the edges and intervacancies spacing. An involved interplay of vacancies sublattice location and nanoribbon edge termination, together with the spacing parameters lead to a wide conductance resonance line-shape modification. Turning on a magnetic field introduces a new length scale that unveils counterintuitive aspects of the interplay between purely geometric aspects of the system and the underlying atomic scale nature of graphene

**Physical Review B 82[16]. 165438. 2010.**

**[P240-10] “Ultrashort-pulse-train pump and dump excitation of a diatomic molecule”**

de Araujo, L. E. E.

An excitation scheme is proposed for transferring population between ground-vibrational levels of a molecule. The transfer is accomplished by pumping and dumping population with a pair of coherent ultrashort-pulse trains via a stationary state. By mismatching the teeth of the frequency combs associated with the pulse trains to the vibrational levels, high selectivity in the excitation, along with high transfer efficiency, is predicted. The pump-dump scheme does not suffer from spontaneous emission losses, it is insensitive to the pump-dump-train delay, and it requires only basic pulse shaping

**Physical Review A 82[3]. 033423. 2010.**

**[P241-10] “Valence-band splitting energies in wurtzite InP nanowires: Photoluminescence spectroscopy and ab initio calculations”**

Gadret, E. G., Dias, G. O., Dacal, L. C. O., de Lima, M. M., Ruffo, C. V. R. S., Iikawa, F., Brasil, M. J. S. P., Chiramonte, T., Cotta, M. A., Tizei, L. H. G., Ugarte, D., and Cantarero, A.

We investigated experimentally and theoretically the valence-band structure of wurtzite InP nanowires. The wurtzite phase, which usually is not stable for III-V phosphide compounds, has been observed in InP nanowires. We present results on the electronic properties of these nanowires using the photoluminescence excitation technique. Spectra from an ensemble of nanowires show three clear absorption edges separated by 44 meV and 143 meV, respectively. The band edges are attributed to excitonic absorptions involving three distinct valence-bands labeled: A, B, and C. Theoretical results based on “ab initio” calculation gives corresponding valence-band energy separations of 50 meV and 200 meV, respectively, which are in good agreement with the experimental results

**Physical Review B 82[12]. 125327. 2010.**

**[P242-10] “X-ray Bragg-Surface Diffraction: A Tool to Study In-Plane Strain Anisotropy Due to Ion-Beam-Induced Epitaxial Crystallization in Fe+-Implanted Si(001)”**

Lang, R., de Menezes, A. S., dos Santos, A. O., Reboh, S., Meneses, E. A., Amaral, L., and Cardoso, L. P.

In-plane strain anisotropy was clearly observed by the X-ray Bragg-surface diffract ion technique in the silicon lattice surrounded by nanoparticles that were synthesized by in ion-beam-induced epitaxial recrystallization process of Fe-implanted amorphous Si layer. High resolution transmission electron microscopy images have shown the occurrence of metallic spherical and plate-like gamma-FeSi<sub>2</sub> nanoparticles in the implanted/recrystallized region. These were found in different orientations within the sample, being responsible for the strain anisotropy detected. The striking anisotropy effect, due to mainly the plate-like nanoparticles in the recrystallized region, appears when comparing two (-6.04 degrees and 83.96 degrees) (002) rocking curves at Bragg-surface diffraction exact condition. Furthermore, the mappings of the (111) Bragg-surface diffraction reflections show an evident anisotropy between phi = -6.04 degrees and 83.96 degrees mappings and also a marked broadening of the implanted sample profile as compared to that of the Si (matrix). Reciprocal space maps obtained for both perpendicular directions clearly exhibit this anisotropic effect in the as direction, thus confirming the Bragg-surface diffraction results

**Crystal Growth & Design 10[10], 4363-4369. 2010.**

# Abstracta

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