

Abstracta

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Trabalhos Aceitos para Publicação

A064-99 à A069-99

Trabalhos Aceitos para Apresentação em Conferências

C007-99

Livro Aceito para Publicação

L 003-99

[A064-99] "Informational-Statistical Thermodynamics of a Complex System."

A. F. Fonseca, M. V. Mesquita, A. R. Vasconcellos, R. Luzzi.

We apply a statistical-thermodynamic approach to the study of a particular physical systems (two sets of nonlinearly coupled oscillators), driven far away from equilibrium. Such system displays a kind of complex behavior consisting in the so-called Fröhlich effect leading in steady-state conditions to a nonequilibrium phase condensation resembling the Bose-Einstein condensation of systems in equilibrium. A kind of "two-fluid model" arises: the "normal nonequilibrium phase" and Fröhlich condensate or "nonequilibrium superphase", which is shown to be an attractor of the system. We work out some aspects of the irreversible thermodynamics of this dissipative complex system. Particular nonlinear properties are discussed and Lyapunov exponents determined. This kind of system gives a good modelling of polar vibration modes in polymers and biopolymers.

Journal of Chemical Physics **112, 9, 3967, 2000****[A065-99] "Giant AC Magnetoresistance and Anisotropic AC Magnetoresistance in Granular Magnetic Alloys."**

A. B. Pakhomov, J. C. Denardin, M. Knobel, O. F. Lima.

AC resistance of melt-spun granular magnetic Cu₈₅Co₁₅ ribbons was measured as a function of temperature in the range 5-300 K, magnetic field HDC in the range -60 KOe to 60 KOe, and frequency in the range 1-1000 Hz. A sharp peak of zero-field resistance, which scales with frequency, and an associated isotropic giant AC magnetoresistance in small fields are observed around the temperature of collective freezing of interacting magnetic moments. Anomalous behavior of AC resistance in large fields (HDC > 20 KOe) is observed in a much broader temperature range. This effect is not only frequency dependent, but also highly sensitive to anisotropy. We call it anisotropic AC magnetoresistance.

Condensed Matter: Materials Science, **2, 9912259, 2000****[A066-99] "Unitary Transformation Approach for the Trapped Ion Dynamics."**

H. Moya-Cessa, A. Vidiella-Barranco, J.A. Roversi, S.M. Dutra

We present a way of treating the problem of the interaction of a single trapped ion with laser beams based on successive applications of unitary transformations onto the Hamiltonian. This allows the diagonalization of the Hamiltonian, by means of recursive relations, without performing the Lamb-Dicke approximation.

Journal of Optics Physics B: Quantum and Semiclassical Optics **2 (1), 2000****[A067-99] "Evolution of the Er Environment in a-Si:H under Annealing: Ion Implantation Versus Co-deposition."**

L. R. Tessler, C. Piamonteze, M. C. Martins Alves, H. Tolentino.

The evolution of the chemical environment of Er in a-Si:H prepared by co-sputtering and by ion implantation under cumulative annealing steps was studied by Extended X-Ray Absorption Fine Structure (EXAFS) at the Er LIII-edge. Samples were prepared by rf-sputtering. In one sample small chunks of metallic Er were attached to the Si target during deposition, resulting in an Er concentration [Er]/[Si] ~ 0.2 at.%. In the other sample a similar Er concentration was ion-implanted. Annealing was performed in 20 min steps between 215 and

1100° C. In the as-co-sputtered sample (which had 7.6 at. % [O]/[Si] intentionally added to improve the Er³⁺ luminescence) the Er environment consists of a 3-fold coordinated oxygen shell. It smoothly evolves towards an Er₂O₃-like 6-fold coordinated shell. In the as-implanted sample the Er environment consists of a 10-fold coordinated Si shell. Annealing up to 450° C makes the Er neighborhood evolve towards a lower coordination. Above this temperature the Er coordination increases, indicating the formation of Er₆ domains around the Er atoms. Only at 750°C the Er coordination starts to decrease, due to the onset of oxidation. The Er oxidation is completed between 850 and 1100° C.

Journal of Non-Crystalline Solids **266-269 (1), 598-602, 2000****[A068-99] "Optimization of the as-deposited 1.54 μm Photoluminescence Intensity in a-SiOx:H<Er>."**

L. R. Tessler, A. C. Iñiguez

Erbium doped a-Si:H has Er³⁺ related photoluminescence at ~ 1.54 μm (~ 0.8 eV). This emission is an intra-4f level transition of the Er³⁺ ion, which can be increased by adding O. In this paper we present a study of the dependence of the Er³⁺ luminescence on Er and O concentration ([Er] and [O]) in a-SiOx:H. Samples were prepared by rf-sputtering from a Si target partially covered by small erbium platelets in an Ar+H₂+O₂ plasma. The maximum Er³⁺ luminescence occurs when [O]/[Er] ~ 10-40. Only up to 3 O atoms form the Er coordination shell. The extra O increases the excitation of the Er³⁺ ions. When [O] increases and the density of states at midgap becomes larger than [Er], the Er³⁺ excitation rate decreases. In optimized samples the temperature quenching is less than a factor 2 from 15 to 300K. The data allow us to conclude that: a) Efficient room temperature Er³⁺ photoluminescence can be obtained from as-deposited a-SiOx:H<Er>. b) The role of O in a-SiOx:H<Er> is more than just providing non-centrosymmetric environments Er³⁺. It also increases the Er³⁺ excitation rate.

Journal of Non-Crystalline Solids **266-269 (1), 603-607, 2000****[A069-99] "'Excitoner' : Stimulated Amplification and Propagation of Excitons 'Beams.'"**

A.R. Vasconcellos, M. V. Mesquita, R. Luzzi

It is presented a statistical-thermodynamic theory of the phenomenon of stimulated amplification of the population of excitons which lie at the bottom of their lowest energy band. The experimentally detected "packet" of excitons flowing ballistically is shown to consist of a Schrödinger-Davydov solitary wave, dressed with a cloud of incoherent excitons. Moreover, a secondary excitation by a c.w. laser beam promotes a Fröhlich-Bose-Einstein-like condensation, which is responsible for the relevant phenomenon that the lifetime of the soliton is largely increased with increasing pumping power.

Europhysics Letters **49 (5), 637-643, 2000**

Accepted papers for conference presentation

[C007-99] "Activated Carbon Fiber Based on Continuously Spun Wood tar Pitch."

G. Capobianco, C.A. Luengo, C. Otani, S. Otani, H.A. Polidoro

Wood tar pitch obtained as a by product of Eucalyptus carbonization process is studied as a raw material for activated carbon fiber production. The wood tar pitch is a low cost and abundantly produced high carbon content natural polymer. This highly oxygenated natural thermoplastic

material was previously treated by means of water/ethanol mixture, and then melt spun and stabilized. The stabilized fibers were carbonized and activated at different temperatures. The characterization are performed by means of surface area (BET), structure (XRD), morphology (SEM) and burn off measurements. The results showed that is possible to produce homogeneous fiber material with surface area as large as 1000 m²/g.

In: EUROCARBON 2000, Berlin-Alemanha, 9-13 Jul, 2000

Livro Aceito para publicação

[L003-99] "STATISTICAL FOUNDATIONS OF IRREVERSIBLE THERMODYNAMICS."

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

São considerados alguns aspectos da física de sistemas de muitos corpos arbitrariamente afastados do equilíbrio, basicamente sua caracterização e evolução irreversível do seu estado macroscópico. Descreve-se o status presente da termodinâmica irreversível fenomenológica, e é apresentada a construção de uma termodinâmica estatística - denominada de Termodinâmica Estatística Informacional -, baseada num formalismo de ensembles estatísticos de não equilíbrio. Este formalismo pode ser considerado como contido no arcabouço da assim chamada Mecânica Estatística Predictiva (introduzindo este anglicismo), na qual sua principal característica é a predição dos estados futuros em termos do conhecimento dos estados presentes e passados, e a questão da historicidade no caso de sistemas com comportamento complexo.

LUZZI, Roberto; VASCONCELLOS, Áurea Rosas; RAMOS, José Galvão de Pisapia. Statistical foundations of irreversible thermodynamics. [s.l.]: Teubner, 2000. 182 p. (35 ; Teubner-Texte zur Physik).

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