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REVIEW

I J P B
— an international journal

Lightning generated ELF, VLF, optical waves and their diagnostic features

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Abstract : Recent observations of optical phenomena above an active lightning discharge such as red sprites, blue jets, blue starters and elves have refocused interest in this field and its consequences. It is argued that during lightning discharge ELF, VLF and optical emissions are generated. Analyzing the recorded data it is clearly shown that intense ELF generation from positive cloud to groud lightning discharge is an indication of the presence of red sprite. Daytime observation of red sprite is difficult and hence ELF waves can work as an indicator.

The diagnostic features of ELF and VLF waves are also discussed and interesting results based on the analysis of whistlers recorded at Indian stations are presented. Recently, association of VLF waves with Earthquakes and red sprites are reported. We have briefly summarized some results related with these phenomena.

Keywords : ELF, VLF waves, optical emissions, lightning discharge, diagnostics.

PACS Nos. : 94.30.Tg, 92.60.Pa, 91.30.Px

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I J P B
— an international journal

Geospot as a source of geothermal energy

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Abstract : The well known sources of geothermal energy that is responsible for affecting various geodynamical processes, do not fulfil the exact requirement of energy needed for these purposes. As an alternative to these tenable sources of energy, we have hypothesised the formation of a strong magnetic field zone, known as geospot, in the core-mantle boundary. The magnetic loops and arches are formed in the *D"* region situated above the core-mantle boundary due to the growing or decaying geospots. When a pair of bipolar regions approach one another, a current sheet is developed, in which magnetic reconnection process takes place, giving rise to the liberation of enormous amount of energy in the form of heat.

Keywords : Geospot, magnetic field, geothermal energy.

PACS Nos. : 91.35.Cb, 91.45.–c

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I J P B
— an international journal

Some observations on microwave propagation under clear air, fog and cloudy atmospheric conditions in Indian southern region

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Abstract : Results carrier intensity of a microwave communication link situated between Raichur and Adoni having path length 60 km and affected by three different atmospheric conditions *viz*. clear air, fog and cloud are presented in this paper. The results are mainly related when the performance of the link was not satisfactory under the three different meteorological conditions. The low signals associated with deep fades were observed for large percentage of time during foggy and cloudy situations. In clear air condition also it has been observed that the carrier intensity was low and associated with large fades. The results on the fadings of signals have been discussed in relation to multipath propagation mechanism.

Keywords : Microwave propagation, clear air, fog, cloud, multipath fading, atmospheric stratification.

PACS No. : 94.10.–s

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I J P B
— an international journal

Hale cycle oriented periodicity in second harmonic of daily variation in cosmic ray intensity on quiet days

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Abstract : The Deep River neutron monitoring data has been harmonically analysed for the period 1964-95 covering three solar cycles 21, 22 and 23 for looking the long term trend and the effect of polarity reversal of solar magnetic field on the semi-diurnal anisotropy of cosmic ray intensity on geomagnetically quiet days. The phase of semi-diurnal anisotropy has significantly shifted to earlier hours during 1967, 1977, 1981-82, 1990-91 and 1995. However, the phase shows a shift to later hours during 1964, 1979 and 1986. The average anisotropy vectors for the periods of negative polarity of solar poloidal magnetic field in northern hemisphere during the period 1964-70 and 1981-90 shifted to later hours; whereas, during positive polarity of solar poloidal magnetic field in northern hemisphere *i.e.*, during 1971-79 and 1992-95, it shifted to earlier hours showing the dependence of the semi-diurnal anisotropy on the polarity of solar poloidal magnetic field, which is attributed to drift effects.

Keywords : Cosmic rays, semi-diurnal anisotropy, solar poloidal magnetic field.

PACS Nos. : 94.40.Kk, 96.40.cd

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I J P B
— an international journal

Oscillator strengths and lifetimes in P V, S VI and Cl VII

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Abstract : Energy levels as well as oscillator strengths and transition probabilities for transitions among the terms belonging to configurations within the principal quantum number $n = 6$ of Na-like phosphorous, sulphur, and chlorine are computed using configuration-interaction wave functions. The calculations have been carried out in both *LS* and intermediate-coupling schemes. The relativistic effects in intermediate coupling are incorporated by means of the Breit-Pauli Hamiltonian. We have also calculated the lifetimes from our radiative decay rates. Our calculated energy levels, oscillator strengths and lifetimes are compared with other theoretical results and experimental data.

Keywords : Atomic energy levels, oscillator strengths, transition probabilities.

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I J P B
— an international journal

Acoustical studies on the effect of urea on the micelles of aqueous surfactants

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Abstract : Acoustical studies are undertaken in aqueous solutions of sodium oleate and sodium taurocholate, which form micelles in aqueous solution. The ultrasonic velocity and attenuation are measured in these solutions in the concentration range 0.001–0.04 molar by adding 0.1 and 0.2 molar urea using a Time Intervalometer (Model-101) at 303 K. From the measured ultrasonic velocity (C) and attenuation $(\alpha/f^2)_{obs}$, various other parameters namely adiabatic compressibility (β_s), freelength (L_f) and excess absorption $(\alpha/f^2)_{ex}$ are calculated and reported. The velocity studies show that the variation of ultrasonic velocity with concentration exhibits a break at the critical micelle concentration (CMC) of the surfactants in water. These studies further establish that the addition of urea shifts the CMC of aqueous surfactants. The results are discussed on the basis of micelle formation and structure breaking nature of urea.

Keywords : Surfactants, urea, micelles, acoustical studies.

PACS Nos. : 43.35.Bf, 82.70.Uv

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I J P B
— an international journal

Dielectric relaxation studies of four different varieties of rapeseed-mustard oil at different temperatures

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Abstract : Dielectric properties of four rapeseed-mustard oil samples of crop year 1998 having different percentage composition of different fatty acids have been studied at 100 KHz, 8.93 GHz and optical frequency of the *D*-lines of sodium. Temperature variation of dielectric properties has also been investigated in the temperature range from 303 to 333 K. $\hat{I}_0$ and $\hat{I}_¥$ both are decreasing with increase in temperature, for each sample under investigation. However, variation of $\hat{I}'$ with temperature exhibits the presence of either a peak or valley at some temperature in all the the four samples, though less prominent in the sample : PCC-2. This may be attributed to the modification in the packing of dipoles at this temperature either due to increase in the overall dipolar correlation or due to reduction in the overall dipolar correlation. The macroscopic relaxation time and various thermodynamic parameters have also been calculated for the dielectric relaxation process. Negative values of molar entropy of activation indicate the existence of cooperative orientation of molecules arising out of steric forces. No specific dependence of dielectric parameters on constituent fatty acids is observed.

Keywords : Dielectric properties, temperature variation, rapessed-mustard oil.

PACS Nos. :

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I J P B
— an international journal

Thermal and mass diffusion on unsteady hydromagnetic flow with heat flux and accelerated boundary motion

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Abstract : This paper concerns with the effect of thermal and mass diffusion on unsteady free convection flow of an incompressible and electrically conducting fluid subjected to constant heat flux and accelerated boundary motion in presence of constant magnetic field. An exact solution has been obtained for species concentration, temperature and velocity variables. The fluid velocity and skin friction have been computed for some saturated liquids. The results are discussed with respect to buoyancy ratio parameter (N) and Hartmann number (m).

Keywords : Thermal and mass diffusion, unsteady hydromagnetic flow, exact solution.

PACS Nos. : 47.15.Cb, 47.65.+a, 44.30.+v

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I J P B
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Vibrational analysis of 1,6-dichlorohexane

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Abstract : A detailed vibrational analysis of already reported infrared and Raman spectra of 1,6-dichlorohexane has been made with the aid of normal coordinate calculations for four conformers of the molecule with symmetries C_{2h}, C_i, C_2 and C_1 found to be present in the neat liquid. It has been established that C_{2h} conformer is most stable and is present in the crystalline solid phase of the compound. Assignment of the observed bands in liquid phase as well as in crystalline solid has been made on the basis of potential energy distribution of the molecule. Many of the previously proposed tentative assignments of frequencies without normal coordinate calculations have been revised in the present study.

Keywords : Infrared and Raman spectra, vibrational analysis, conformations, 1,6-dichlorohexane.

PACS Nos. : 33.20.Ea, 33.20.Fb, 33.20.Tp

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I J P B
— an international journal

Infrared and Raman spectral studies and evaluation of force fields for the three isomeric methoxy benzaldehydes

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Abstract : Infrared and Raman spectra of three isomeric methoxy benzaldehydes have been studied and vibrational assignments to different infrared and Raman wavenumbers have been proposed. In order to check the proposed vibrational assignments, force field calculations using the Wilson's FG-matrix method were carried out. It could be possible to assign all the 48 normal modes and determine consistent force fields for all the three molecules.

Keywords : Force fields, IR and Raman spectra, vibrational spectra.

PACS Nos. : 33.20.Ea, 33.20.Fb, 33.20.Tp

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I J P B
— an international journal

Use of optical emission spectroscopy to monitor the silane-argon plasma

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Abstract : Optical emission spectroscopy (OES) was used to characterize the radio frequency (*rf*) glow discharge plasma of flowing mixtures of silane and argon. The intensity variation of the peak at 414.2 nm arising due to SiH ($A^1D - X^2P$) transition has been studied with respect to power density in the range 20.4 mW/cm^2 to 787 mW/cm^2 for wide variation of silane to argon flow ratio from 5 : 95 to 40 : 60. The concentration of SiH* species was calculated by the proposed model based on the kinetics od the dominant reactions in the plasma. We see that the theoretically calculated curves can explain the general trend of variation of the experimental curves with increase of power density.

Keywords : Optical emission spectroscopy (OES), *rf* glow discharge, silane, chemical kinetics.

PACS Nos. : 52.70.Kz, 81.15.Gh, 82.20.Pm

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NOTE

I J P B
— an international journal

Laser Raman and FT-IR spectroscopic study of antimony thiourea bromide crystals

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Abstract : Single crystals of orthorhombic antimony thiourea bromide (ATBO) and monoclinic antimony thiourea bromide (ATBM) have been grown in gels at ambient temperature using a controlled chemical reaction method. The laser Raman and FT-IR spectra of the gel grown ATBO and ATBM crystals have been recorded. The presence of thiourea ion, water molecules and normal mode vibrational frequencies are identified and discussed. The basic ideas regarding the normal modes of vibration, selection rules for Raman and IR spectra, hydrogen bonding effect are considered in brief.

Keywords : Laser Raman, FT-IR spectra, antimony thiourea bromide, crystal spectra.

PACS Nos. : 33.20.Ea, 33.20.Fb