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Physical Sciences Section

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TRACE METAL ANALYSIS IN FRESH AND WEATHERED CRUDE OILS

A. A. OLAJIRE* AND R. A. ODERINDE

Department of Chemistry, University of Ibadan, Ibadan, Nigeria

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Energy dispersive X-ray fluorescence spectroscopy was used to determine Fe, Cd, Pb, Ni, Mn, Zn, Cu, V, As, Hg and Se in the Nigerian fresh and weathered crude oils. Weathered crudes consisted of fresh crudes weathered for 2, 7 and 14 days under ambient outdoor conditions. Vanadium, nickel, iron and copper concentrations in both the fresh and weathered crudes ranged from 12 to 114 ppm; 4.2 to 12 ppm; 45 to 182 ppm and 22 to 81 ppm respectively. Other metals, i.e. lead, cadmium and manganese were observed at the 0.42 to 11 ppm level whereas mercury, zinc, arsenic and selenium were present in very low level (0 - 0.02 ppm). For the weathered report, the values were increasing as weathering progressed. An attempt was made to assess the applicability of V:Ni ratio for passive tagging of oils.

Key words: Fresh and weathered crudes, Trace elements; ED - XRF techniques.

CHARACTERIZATION OF MIXED LIGAND COMPLEXES OF Cr(III) AND Fe(III) WITH PYROGALLOL AND HETEROCYCLIC AMINES

M. SAIDUL ISLAM, M. YEAMIN REZA AND M. MASIR UDDIN

Department of Chemistry, Rajshahi University, Rajshahi, Bangladesh

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The octahedral mixed ligand complexes of the type $K[Cr(PGH)_2L_2]$, $K[Cr(PGH)_2L']$, $K[Cr(PGH)_2L'']$ and $K[Fe(PGH)_2L_2]$, $K[Fe(PGH)_2L']$, $K[Fe(PGH)_2L'']$; where PGH = Deprotonated pyrogallol; L = Quinoline (Q), Isoquinoline (IQ), α -picoline (α -Pic), γ -picoline (γ -Pic); L' = 2-aminopyridine (2-APY), 3-aminopyridine (3-APY), L'' = Pyridine (PY), were prepared in the solid form and characterized on the basis of elemental analysis, conductivity measurements, magnetic measurements, infrared and electronic spectral studies.

Key words: Complexes, Phenols, Amines.

NORMAL COORDINATE ANALYSIS OF THE ZERO-WAVE VECTOR VIBRATIONS OF $\text{ErBa}_2\text{Cu}_3\text{O}_7$

S. MOHAN AND A. SUDHA

Raman School of Physics, Pondicherry University, Pondicherry 605 014, India

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Using Wilson's FG matrix method, a normal coordinate analysis of the spectral frequencies and form of the zero-wave vector vibrations of the high temperature superconductor $\text{ErBa}_2\text{Cu}_3\text{O}_7$ have been performed. The vibrational frequencies and potential energy distribution of 21 infrared active and 15 Raman active modes are presented. The potential constants employed here are given and the evaluated vibrational frequencies are compared with the available experimental values.

Key words: Normal coordinate, Analysis, $\text{ErBa}_2\text{Cu}_3\text{O}_7$.

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CORRELATION OF THE OPTICAL PROPERTIES AND INTERBAND TRANSITION OF VANADIUM THIN FILMS

S.S. FOUAD

Faculty of Education, Ain Shams University, Cairo, Egypt

(Received January 25, 1992; revised April 19, 1993)

The possibilities of using the optical constants n and k of vanadium thin films, to calculate the free-electron optical effective masses and relaxation time which were derived from the results, are discussed from the theoretical and experimental point of view. Throughout the optical constants, the optical conductivity $\sigma = \sigma_1 + \sigma_2$ as well as the volume and surface energy loss function are derived. The interband contribution to the imaginary part of the dielectric constant is also obtained by subtracting the free electron contribution.

Key words: Optical constants (n & k), Vanadium thin films, Transition.

EXTRACTION AND GC/MS ANALYSIS OF THE ESSENTIAL OIL OF *OCIMUM BASILICUM* (COMORO)

M. RIAZ, M. RASHID KHALID, M. HANIF AND F. M. CHAUDHARY

PCSIR Laboratories Complex, Lahore-54600, Pakistan

(Received October 21, 1992; revised April 27, 1994)

A combination of GC and GC/MS has been used to characterise chemical composition of essential oil hydrodistilled from comoro variety of *Ocimum basilicum* grown in various parts of Pakistan. Among the forty four compounds identified, methyl chavicol (83.58-87.21%), 1, 8-cineol (2.45-3.37%), linalool (0.04 - 2.69%) and methyl eugenol (1.4 - 2.68%), are predominantly present while other compounds particularly monoterpenes and sesquiterpenes hydrocarbons are found only in traces. Variations in the essential oil composition and yield during hydrodistillation are also reported.

Key words: *Ocimum basilicum*, Essential oil, Sesquiterpenes, GC/MS analysis.

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THERMOGRAVIMETRIC AND INFRARED SPECTRAL STUDIES FOR RAPID EVALUATION OF ROCK PHOSPHATES

MAHMOOD A. KHWAJA AND ISMAT G. KHATTAK*

PCSIR Laboratories, Peshawar - 25120, Pakistan

(Received October 23, 1993; revised May 26, 1994)

Thermal, infrared spectral and chemical analyses have been carried out on fourteen rock phosphate samples from five deposits in Hazara, North West Frontier Province (NWFP), Pakistan. Samples with high phosphate content have shown less than 3% loss in weight on ignition and a set of two characteristic medium intensity absorption bands in the range $1460\text{-}1420\text{ cm}^{-1}$. On the other hand ores samples with low phosphate content have shown high loss in weight on ignition and only one absorption band around $1460\text{-}1420\text{ cm}^{-1}$ in their infrared spectra. The analytical data described and discussed in this paper suggests that TGA/DTA and infrared spectral techniques may be used as a rapid means for the preliminary selection of ore-grades, in place of conventional techniques.

Key words: Phosphates, Infrared, Thermogravimetry.

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ACTIVATED CARBON FROM INDIGENOUS INFERIOR WOODS

Part-V. Granular Activated Carbon Preparation and Liquid Phase Characterization

TANZIL H. USMANI, TAMOOR WAHAB AHMAD, MOHAMMAD MUMTAZ, M. TAHIR MOTAN AND A.H.K. YOUSAFZAI
PCSIR Laboratories Complex, Karachi-75280, Pakistan

(Received August 19, 1992 ; revised June 16, 1994)

The effect of zinc chloride in different impregnation ratios on various physical and chemical properties of granular activated carbon prepared from saw dust (0.250-0.473 mm) of 'Babul' (*Acacia arabica*) has been studied. It has been found that zinc chloride acts both as an activating agent as well as a binder during this process. The suitability of gelatinous mass used for granulization with different impregnation ratios has been studied and an appropriate ratio established. The activity of the product has been evaluated in liquid phase against adsorbates of different molecular dimensions. Granular carbon suitable for adsorption of small and larger molecules (micro and meso) may be prepared by chemical impregnation method.

Key words : Activated carbon, Granules, Inferior wood, Impregnation ratio, Liquid phase.

Biological Sciences Section

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INFLUENCE OF LODGING AND NITROGEN RATE ON THE YIELD AND YIELD ATTRIBUTES OF OILSEED RAPE (*BRASSICA NAPUS* L.).

N. ISLAM* AND E. J. EVANS

Department of Agriculture, The University Newcastle Upon Tyne, NE1 7RU, England

(Received April 22, 1992 ; revised March 12, 1994)

Effects of lodging and nitrogen rate were studied in a field trial of oilseed rape *Brassica napus* L. Lodging decreased seed yield (16%) compared with a frame-raised crop. The yield decreased because of a significant reduction of each of the yield components coupled with a reduced plant population caused by stem breakage at the ground level. Lodging also reduced the final crop dry weight and harvest index. Seed yield also decreased from the 400 kg ha⁻¹ of nitrogen application compared with 200 kg ha⁻¹. A general decrease in pod number m⁻², seed number pod⁻¹ and seed weight caused lower yields. The use of 400 kg ha⁻¹ of nitrogen changed the contribution of terminal raceme and individual branches with respect to seed yield. Seed nitrogen content and nitrogen yield increased at the 400 kg ha⁻¹, lowering both seed oil content and oil yield.

Key words: Lodging, Nitrogen rate, *B. napus* L.

EVALUATION OF MIXED AND COMPLEX FERTILIZERS FOR WETLAND RICE

A. T. M. A. CHOUDHURY, S. K. ZAMAN AND N. I. BHUIYAN

Soil Chemistry Division, Bangladesh Rice Research Institute, Gazipur-1701, Bangladesh

(Received September 26, 1993; revised April 20, 1994)

Three grades of mixed/complex fertilizers were field tested in wetland rice culture at Bangladesh Rice Research Institute (BRRI) farm during dry and wet seasons of the year 1992 using randomized complete block design with a view to evaluate their effectiveness against straight fertilizers. Test varieties were BR3 and BR11 for dry and wet seasons, respectively. Results implied that mixed/complex fertilizers were equally effective as straight fertilizers in increasing grain yield of rice. Mineral nutrition of and nutrient removal by rice plants were also almost similar irrespective of fertilizer sources.

Key words. Mixed/complex fertilizer, Straight fertilizer, Rice.

DETECTION OF BACTERIAL PATHOGENS IN PADDY SEED LOTS IN PAKISTAN

A. RAUF BHUTTA AND SYED IRFAN AHMAD

Federal Seed Certification Department (Food and Agriculture Division), Mauve Area, G-9/4, Islamabad, Pakistan

(Received July 24, 1993; revised May 10, 1994)

One hundred and fifty three seed samples were collected from major paddy crop growing areas during 1987-88 to 1990-91 and tested for the presence of seed-borne bacterial pathogens using a seedling symptom test. Maximum seed infection due to *Xanthomonas oryzae* pv. *oryzae*, ex Ishiyama (Swings *et al.*) was 11 and 12% in variety IRRI-6 at Lahore and Hyderabad respectively. While in case of *Acidovorax avenae* sub sp. *avenae*, infection was 13% in variety B-385 from Sahiwal. It was observed that the percentage of seed infection due to bacterial pathogens varied from cultivar to cultivar in different localities. Keeping in view the high infection level of these bacterial diseases, future studies are needed on seed transmission and epidemiology of these pathogens for better disease control strategies.

Key words: Seed-borne, Bacterial diseases, Paddy (Rice).

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COMBINING ABILITY ANALYSIS IN *ORYZA SATIVA* L.

SYED SULTAN ALI, M. AKRAM, S. I. YASIN, T. Z. KHAN AND M. G. KHAN

Rice Research Institute, Kala Shah Kaku, Lahore, Pakistan

(Received March 7, 1992; revised May 26, 1994)

A diallel cross involving four rice cultivars; Basmati 370, Basmati 385, 4048 and Basmati 198 was studied in the F_1 generation for anther length, 100-anther weight, pollen grain size and percent filled spikelets. Both general combining ability (GCA) and specific combining ability (SCA) were significant for all traits except pollen grain size. The GCA mean square magnitude was considerably higher than SCA mean square for anther length and 100-anther weight. The inverse was found for percent filled spikelets. It reveals additive gene effects for anther length, 100-anther weight and dominance gene effects for percent filled spikelets. Basmati 198 displayed positive and significant general combining ability effects for anther length and 100-anther weight. Basmati 370 was the best general combiner for percent filled spikelets. 4048 x Basmati 198, Basmati 370 x 4048 and Basmati 370 x Basmati 385 were the best specific combiners for anther length, 100-anther weight and percent filled spikelets respectively and are expected to contribute higher frequency of desirable plants than other crosses in subsequent generations.

Key words: Diallel, Anther length, Additive, Rice.

Technology Section

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PRODUCTION OF OXYTETRACYCLINE BY DIFFERENT MUTANTS OF *STREPTOMYCES RIMOSUS* INDUCED BY DRY AND WET HEAT IN A DATE MEDIUM

N.A. BAESHIN, A.A. ABOU-ZEID*, A.O. BAGHLAF

Biology, Biochemistry, Chemistry Departments, King Abdulaziz University, Jeddah-21413, Saudi Arabia

(Received April 29, 1993; revised January 1, 1994)

Dry heat was more effective as physical mutagen than wet heat for *Streptomyces rimosus*. The optimal dose of temperature for inducing auxotrophic mutants in *Streptomyces rimosus* was 55° under dry treatment conditions. Two mutants only out of 138 dry and wet heat mutants produced higher antibiotic titres than the parent organism.

Key words: Oxytetracycline, Mutants of *S. rimosus*, Dry and wet heat, Date medium.

EXTENSION AND EVALUATION OF ICP TORCH LIFE SPAN FOR INDUCTIVELY COUPLED PLASMA EMISSION SPECTROMETRY

F. O. BAMIRO AND D. LITTLE JOHN*

Department of Chemistry, University of Agriculture, Abeokuta, Nigeria

(Received April 21, 1993; revised April 24, 1994)

The life span of melted Philips torch has been extended for laboratory use by modifying the damaged Philips torch and then compared with that of a standard Philips torch. The construction of the modified torch is simple, easy to assemble and replace, and is ideally suited for the analysis of sample solutions by inductively coupled plasma spectrometry. Evaluation of the modified torch reduced cost, usually caused by constant melting of ICP torch and also gave similar results in terms of precision, sensitivity and detection limits when compared with the conventional new ICP Philips torch (type 145).

Key words: Repair of damaged ICP torch, Formation of concentric quartz tube, Performance evaluation.

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Studies on Life Processes: Hydration of the Microenvironment and Fungal Growth

MIRZA ARSHAD ALI BEG, NAHEED ABDULLAH* AND
SAEED IQBAL ZAFAR*

PCSIR, 39 Garden Road, Saddar, Karachi-74400, Pakistan

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Seed-borne Fungi of Wheat Cultivars in Pakistan

M. QASIM KHAN AND A. RAUF BHUTTA

*Federal Seed Certification Department, Mauve Area,
G-9/4, Islamabad, Pakistan*

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