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Physical Sciences

Biological Sciences

Short Communication

Technology

Review

Pak. J. Sci. Ind. Res. 2010 **53** (2) 59-62

Physical Sciences

Emission of Fragment Masses Between 4 Amu and 30 Amu in the Heavy Ion Interaction of (14.0 MeV/u) Pb + Pb

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Abstract. Using two threshold solid state nuclear detectors, mica and CN-85, the reaction of (14.0 MeV/u) Pb + Pb was studied. Reaction cross-section was determined experimentally as well as theoretically. Both elastic and inelastic data were used to calculate the experimental reaction cross-section. Theoretical reaction cross-section for 14.0 MeV/u Pb +Pb is 3809 ± 428 mb. Reaction cross-sections from elastic data were 3830 ± 500 mb and 3875 ± 500 mb for mica and CN-85, respectively, While reaction cross-sections calculated from inelastic data for mica and CN-85 were 4081 ± 500 mb and 4092 ± 500 mb, respectively. The partial reaction cross-sections for mica and CN-85 detectors were also determined. It was observed that partial cross- section of inelastic binary events in mica was higher than that in CN-85, whereas, cross section of 4 and 5-pronged events in mica were lower than those in CN-85. However, the number of three pronged events was identical in the two detectors. Using the difference in mass registration threshold of the two detectors, for fragment masses between 4 amu (registration threshold of CN-85) and 30 u (registration threshold of mica) were searched, which were registered in CN-85 but not in mica.

Keywords: heavy ion interaction, solid state nuclear track detectors, total and partial reaction cross-sections, theoretical reaction cross-section, light particle emission.

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Synthesis and Reactivity of Some Peroxo Complexes of Zirconium(IV) Thorium(IV) and Uranium(VI) Ions Containing a Quadridentate, Quadrinegative Ligand and a Pentadentate Dinegative Schiff Base

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Abstract. Some new peroxo complexes of zirconium, thorium and uranium containing a quadridentate, quadrinegative organic ligand and a pentadentate dinegative Schiff base ligand have been synthesized and characterized by elemental analyses, magnetic measurements and various spectral studies. Oxygen transfer reactions of some complexes toward different substrates have been investigated. The Schiff base, LH_2, was derived from the condensation of 2,6-diaminopyridine with salicylaldehyde. The present ligands undergo deprotonation during complexation coordinating with $(OOOO)^{4-}$ and $^{-}ONNNO^{-}$ donor sequences, respectively. The complexes have the compositions, $[M(O_2)\ (OOOO)].\ 2H_3O^{+}$ [M = Zr(IV) and Th(IV), OOOO = DCTA], $[UO(O_2)\ (OOOO)].2H_3O^{+}$; $[M(O_2)\ (ONNNO)]$ [M = Zr(IV) and Th(IV), $^{-}ONNNO^{-}$ = L] and $[U(O)\ (O_2)\ (ONNNO)].H_2O$. The chelate effect of the quadridentate and pentadentate ligands stabilizes the metal peroxide moieties precluding oxygen transfers to organic and inorganic substrates. The mode of coordination is also influenced by the σ-donor electronic nature of the multidentate ligands. The IR spectral data also indicate that the υ_1(O-O) stretching modes decrease with and increase in the atomic number of the metals in a group.

Keywords: peroxo complexes, quadridentate and pentadentate ligands, heavy metal ions

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Thermal Activation of Bagasse Ash in High Strength Portland Cement Mortar

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(received September 18, 2009; revised January 27, 2010; accepted January 28, 2010)

Abstract. The pozzolonic reactivity of bagasse ash was enhanced using thermal activation technique by curing mortar specimens containing bagasse ash, at 20, 40 and 60 °C and the samples were tested for compressive strength at the age of 3, 7 and 28 days. Results indicated that bagasse ash is very sensitive to temperature rise and thus the application of thermal activation is very useful when early age strength development is desired. Bagasse replacement by 30% at 40 °C and 60 °C increased the mortar strength at 7 days by 10 and 18% more than the control, respectively.

Keywords: bagasse ash, thermal activation, portland cement mortar

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Extraction and Characterisation of *Dioclea reflexa* Hook. F. Seed Oil

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(received July 14, 2009; revised February 4, 2010; accepted February 13, 2010)

Abstract. Physicochemical analysis of the oil of *Dioclea reflexa* Hook f. seeds revealed the acid value, saponification value, iodine value, ester value and iodine number of the seeds to be 8.69 mg KOH/g, 251 mg KOH/g, 72.8 mg I/g, 242 and 27.9, respectively. The fatty acid composition determined by gas chromatography (GC) showed individual unsaturated fatty acid to be oleic acid (18:1), 0.8%, while the saturated fatty acids were palmitic acid (16:0), 10.2% and stearic acid (18:0), 21.9%. The infrared spectroscopy (IR) of the oil was also undertaken. The high saponification and iodine values of *D. reflexa* oil suggest its possible utilization in alkyd resin, shoe polish, liquid soap and shampoo production.

Keywords: *Dioclea reflexa*, physicochemical analysis, Fabaceae, fatty acid, seed oil

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Antioxidant Properties of *Telfairia occidentalis* as Affected by the Market Storage Method in Nigeria

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Abstract. The effect of market storage methods in Nigeria on the antioxidant properties of *Telfairia occidentalis* was assessed over a period of 96 hours with respect to the vitamin C, total phenol and phytate contents, as typified by their reducing power and free scavenging ability. *T. occidentalis* had a phytate content of 28.83 mg/100 g and there was no significant (P>0.05) difference in the phytate content in the first 24 h of storage but significantly (P>0.05) reduced at the end of the storage period of 96 h (26.74 mg/100 g) with 7.24% loss. Vitamin C content reduced significantly (P>0.05) as the storage period increased with a very high percentage loss (81.58%) at the end of the storage period. The vegetable had 2.78 mg GAE/100 g total phenol and was slightly reduced but not significant (P>0.05) during the first 24 h of storage. *T. occidentalis* had scavenging ability > 90%, which significantly (P>0.05) decreased as the storage period increased (57.47% loss at 100% conc. and 56.28 % loss at 50% conc.).

Keywords: *Telfairia occidentalis,* vitamin C, total phenol, phytate, storage reducing power, scavenging ability

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Colour Removal from Textile Dyeing Wastewater Using Different Adsorbents

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(received May 28, 2009; revised December 1, 2009; accepted January 6, 2010)

Abstract. The ability of different adsorbents/coagulants, such as liquid and solid polymers, ferric chloride, calcium carbonate and coal ash, was investigated for uptake of (reactive dyes, Red - 120, Yellow - 14 and Blue - 4 from textile dyeing waste. Coal ash was used for the colour removal from the textile dyeing wastewater of reactive dyes. Different adsorbents removed the colour from the effluent in different degrees; in some cases the colour was removed 100%. White polymer was ineffective. Calcium carbonate gave excellent results. Liquid polymers were better effective than the solid ones. Coal ash yielded good results without any further treatment.

Keywords: industrial wastes, dyes, colour removal, adsorbents

Biological Sciences

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Studies on Antifungal Activity and Elemental Composition of the Medicinal Plant *Trianthema pentendra* Linn.

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(received October 7, 2009; revised February 13, 2010; accepted February 20, 2010)

Abstract. Antifungal activity of crude solvent and aqueous extracts of the medicinal plant, *Trianthema pentendra* Linn., against the dermatophytic fungi, *Aspergillus niger*, *Aspergillus flavus*, *Paecilomyces varioti*, *Microsporum gypseum and Trichophyton rubrum* revealed that ethanol and aqueous extracts were the most effective antifungal agents as compared to methanol, chloroform and ethyl acetate extracts. Some basic elements, Al, Ca, Cu, Fe, Mg, Mn, P, S and Zn were also determined in the medicinal plant, *T. pentendra*, using atomic absorption spectrophotometry and U.V spectrophotometry. *T. pentendra* contained considerable amount of elements which have therapeutic effects in skin diseases.

Keywords: *Trianthema pentendra*, antifungal activity, essential elements

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Culture of *Ceriodaphnia cornuta*, Using Chicken Manure as Fertilizer: Conversion of Waste Product into Highly Nutritive Animal Protein

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(received August 6, 2009; revised January 26, 2010; accepted February 10, 2010)

Abstract. For finding a cheap and suitable feed for culture of *Ceriodaphnia cornuta* studies were carried out for 21 days using chicken manure as fertilizer whereupon *C. cornuta* population ranged between 50 ± 2 and 10,232 ± 202 Ind./L. (individuals/L). The culture peaked on the 17th day producing the maximum density of 10,232 ± 202 Ind./L. Thus chicken manure can be used as a fertilizer for mass culture of cladocerans, specially *C. cornuta*.

Keywords: culture, chicken manure, *Ceriodaphnia cornuta*, live feed

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Contribution of Micronutrient Fertilization in Wheat Production and its Economic Repercussions

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Abstract. Wheat response to the application of Zn, Fe and B in rice-wheat cropping pattern at ten locations in the fields in the Punjab, Pakistan was studied. The highest mean wheat grain yield (4707 kg/ha) was recorded with application of Zn:B @ 5:1 kg/ha, followed by 4678 kg/ha with Zn:Fe @ 5:10 kg/ha. The three micronutrients increased the grain yield from 1.8 to 11.8% over control, highest being recorded with the application of Zn:B @ 5:1 kg/ha. Combined application of all the three micronutrients reduced the grain yield by 1% compared to the highest yield attained by the combine application of Zn and B. However, the application of Zn @ 5 kg/ha proved to be the most economical micronutrient application with VCR of 4.80. None of the three nutrients increased the wheat grain yield in Gujrat, whereas Zn significantly increased the grain yield over control in Mandi Bahauddin. Straw to grain ratio of wheat was significantly decreased by the application of micronutrients over control mainly due to increase in grain weight.

Keywords: micronutrients, wheat, fertilizer, zinc, iron, boron

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Grain Yield Losses in Wheat by Russian Wheat Aphid *Diuraphis noxia* (Mordvilko)

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Abstract. Eight wheat cultivars were sown at the Regional Agricultural Research Institute, Bahawalpur, Pakistan, to evaluate their response to Russian wheat aphid (RWA) *Diuraphis noxia* (Mordvilko). Significant variability was observed among cultivars with respect to aphid infestation and yield losses. Cultivar V-2707 was the least infested with the aphid (6.3 aphids/tiller) giving maximum grain yield (4638 kg/ha), with cultivar V-2047 the second best with 6.43 aphids/ tiller infestation and grain yield of 4206 kg/ha. Commercial cultivars (Inqlab-91 and Punjab-96) were heavily infested with 14.4 and 12.6 aphids/tiller, respectively, and yielded 2245 and 2490 kg/ha harvest, respectively. Aphid population increased upto the fourth week of March and then declined. Aphid infestation resulted in 3.96 to 7.36% yield loss. The cultivar V-2707 was later released for general cultivation, under the name of Punjab-1.

Keywords: *Triticum aestivum*, aphid, yield loss, *Diuraphis noxia*

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Short Communication

Staining Effect of Yellow Dye Extracted from Wood of *Berberis vulgaris* L. on Angiospermic Stem Tissues

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(received March 31, 2009; revised February 11, 2010; accepted February 13, 2010)

Abstract. Yellow dye was chemically extracted from wood of *Berberis vulgaris* L. using water and ethanol and its effectiveness as staining agent for angiosperm stem tissues was studied. The dye stained the lignified tissues of both monocotyledonous as well as dicotyledonous stem cross sections. However, the dye extracted in ethanol (10% w/v) was found more effective to stain the lignified tissues of plants.

Keywords: yellow dye, *Berberis vulgaris* L., angiospermic stem tissues

Technology

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Effect of Low Cost Iron Oxide with Si Additive on Structural Properties of Ni-Zn Ferrite

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Abstract. Mixed Ni-Zn ferrites (x = 0.66, 0.77, 0.88, 0.99) were prepared by double sintering ceramic method using locally available low cost Fe_2O_3 with 0.5% (by wt) of Si additive. The chemical phase analysis, carried out by X-ray powder diffraction method, confirms the major phase of Ni-Zn ferrite. Study of the effect of composition on structural properties of ferrite system revealed a decreasing trend of lattice parameters with increasing Ni content. X-ray density and mass density increase with increasing Ni content, which in turn decreases the porosity due to successive presence of Si in Fe_2O_3. This decrease in porosity along with chemical homogeneities, distribution of phases and grain formation were also observed in scanning electron micrographs.

Keywords: Ni-Zn ferrites; Si additive; iron oxide; ceramics

Review

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A Review of Σ Hypernuclear Physics

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Abstract. A concise overview of fundamental Σ hypernuclei physics and the mechanisms of hypernucleus formation and interactions are presented. Σ–Λ interaction and strong force-mediated hyperon-nucleon interaction are introduced to give an epigrammatic background and current perspective of the subject. A model phenomenological elementary Sigma-Nucleus (Σ-N) potential has been constructed and reported here as an instance of ΣN interaction. The potential incorporates both spin and isospin dependence and may be useful in calculating Hamiltonians, cross sections and decay widths in Σ hypernuclear reactions.

Keywords: ΣN potential; Σ–Λ conversion; woods-saxon potential; lane potential
PACS numbers: 21.80.+a, 24.50.+g; 25.80.Nv