

Physical Sciences

- The Impact Parameters of the Broadening and Shift of Spectral Lines**
M. S. Helmi and G. D. Roston 6856-SB 75
- Isomerization of 1,5-Hexadiene Catalyzed by Bis-(Cyclopentadienyl) Lanthanide Schiff Base/NaH Systems; Ln = Sm, Dy, Y, Er**
Muhammad Yousaf, Yanlong Qian and Muhammad Khalid Saeed 6978-SB 81
- Beneficiation Studies on the Low-Grade Chromite of Muslim Bagh, Balochistan, Pakistan**
S. Atiq, Irfan Hafeez, K. Khan and M.A. Malik 6816-SB 86
- Studies on the Adsorption of Copper (II) by Activated Charcoal and its Application in the Treatment of Textile Industry Effluents**
Hajira Tahir, M. Nasiruddin Khan and Anila Sarwar 6862-GH 90
- Biomagnification of Some Heavy and Essential Metals in Sediments, Fishes and Crayfish from Ondo State Coastal Region, Nigeria**
S. S. Asaolu and O. Olaofe 6944-SB 96
- Indoor NO₂ Sampling in a Large University Campus in Benin City, Southern Nigeria, Using Palmes Diffusion Tubes**
E. E. Ukpebor, Y.T. Sadiku and S. I. Ahonkhai 103

Short Communications

- Quantitative Determination of Sinensetin in *Orthosiphon stamineus* Leaves by Thin-Layer Chromatography and Imaging Densitometry**
M. Amzad Hossain, Zakri Zakaria and Zhari Ismail 6930-SI 108
- Effect of Storage on the Physicochemical Properties of Palm Oil**
F. O. Abulude, M. O. Ogunkoya and O. S. Eluyode 6906-GQ 110

Biological Sciences

- Hybridization Studies in Normal and Cracked-Skull Diseased African Catfish, *Clarias gariepinus***
O. Fagbuaro, J.I. Awopetu, M.A. Faluyi and P.O. Aluko 6864-SI 113
- A Comparative Study of the Food and Feeding Habits of *Chrysichthys nigrodigitatus* and *Brycinus nurse* in a Tropical River**
C. G. Oronsaye and F. A. Nakpodia 118
- Biological Evaluation of Extracts and Triterpenoids of *Euphorbia hirta***
M. Abu-Sayeed, M. Abbas Ali, P.K. Bhattacharjee, Anwarul Islam, G.R.M. Astaq, Mohal Khan and Sharmina Yeasmin 6976-SB 122

Short Communications

Blood Clotting Effect of Leaf Extracts of *Bryophyllum pinnatum*

J. M. Okuo and I. M. Ejimadu 6854-SB

126

Development of Stabilized Vegetable Amylases for Enzymatic Desizing of Woven Fabric with Starch Containing Sizes

S. Ishrat Ali and A. Farhan Khan 6801-TA(SB)

128

Technology

Effect of Part Replacement of Mercaptobenzothiazole with Locust Bean Cake on the Thermal and Electrical Conductivities of Natural Rubber Vulcanizates

B.F. Adeosun, A.E. Oyeleke and E.G. Olumayede 6882-SI

131

Factors Affecting the Geometric and Tensile Properties of Stretch-Knitted Cotton Fabrics

S. Muhammad Nawaz, Assad Farooq, Babar Shahbaz and Ghulam Murtza 6960-GQ

135

Review

Castor Oil: A Vital Industrial Raw Material

6735-SB

D. S. Ogunniyi

143

The Impact Parameters of the Broadening and Shift of Spectral Lines

M. S. Helmi and G. D. Roston*

Department of Physics, Faculty of Science, Alexandria University, Alexandria, Egypt

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Abstract. The classical theory of collisional broadening and shift coefficients (β , δ) of an isolated spectral line was used to obtain simple analytical formulae for calculating both β and δ . These formulae were obtained on the assumption that the short range interaction was effective only in the broadening, while the long range was effective in the shift of the spectral line. These coefficients, β and δ depended on the limiting phase shifts responsible for broadening η_{ob} and shift $\eta_{o\delta}$. It was found that the values of η_{ob} and $\eta_{o\delta}$ were not equal to each other, as was proposed by Weisskopf $\eta_{ob} = \eta_{o\delta} = 1$, but were instead $\eta_{ob} = \pm \pi / 5$ and $\eta_{o\delta} = \pm \pi / 2$. The correct signs of these phases were obtained and defined. When these phases were applied with their correct signs in the approximate formulae, the broadening β_c and shift δ_c coefficients for some interactions of Tl, Hg, Cd, Zn, Ar and Ne with inert gases and self-interactions were in agreement with the corresponding values obtained numerically by other authors. The limit at which the shift changed its sign was also obtained. New impact parameters which were not known up to now have been discussed and obtained.

Keywords: spectral line, broadening coefficient β , shift coefficient δ , impact parameters, spectral line shift, spectral line broadening

Isomerization of 1,5-Hexadiene Catalyzed by Bis-(Cyclopentadienyl) Lanthanide Schiff Base/NaH Systems; Ln = Sm, Dy, Y, Er

Muhammad Yousaf*^{ac}, Yanlong Qian^a and Muhammad Khalid Saeed^b

^aLaboratory of Organometallic Chemistry, East China University of Science and Technology, Meilong Road 130#, 200237, Shanghai, Peoples Republic of China

^bBiotechnology and Food Research Centre, PCSIR Laboratories Complex, Lahore, Pakistan

^cPresent address: Government Ghazali College, Jhang, Pakistan

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Abstract. Catalytic isomerization of 1,5-hexadiene by Cp₂Ln Schiff base/NaH (Schiff base = C₁₄H₁₄NO₂, Ln = Sm, Dy, Y, and Er) systems was studied. The isomerization resulted in a mixture of 1,4-hexadiene, 2,4-hexadiene, 1,3-hexadiene, methylene-cyclopentane, and methylcyclopentene. 1,4-Hexadiene and methylenecyclopentane were the intermediate products, while 2,4-hexadiene and methylcyclopentene were the end-products. The effects of the nature of catalyst, temperature, amount of the catalyst, time and solvent, on the isomerization rate and product composition were also studied. The ratio of the linear to the cyclic product in the reaction depended on the amount of catalyst used.

Keywords: isomerization, 1,5-hexadiene, 2,4-hexadiene, lanthanocene complexes, Schiff base/NaH systems, methylcyclopentene

Beneficiation Studies on the Low-Grade Chromite of Muslim Bagh, Balochistan, Pakistan

S. Atiq*, Irfan Hafeez, K. Khan and M.A. Malik

PCSIR Laboratories, Quetta, Pakistan

(received October 5, 2002; revised December 16, 2004; accepted January 1, 2005)

Abstract. Low-grade chromite of Muslim Bagh, Balochistan, Pakistan was beneficiated to produce chromite concentrate by cationic flotation using disodium *n*-octadecyl sulfosuccinamate as collector. Effect of various parameters such as grind size, pulp density, pH, and conditioning time on the overall grade and recovery of chromite was also investigated. Particle liberation studies during this investigation revealed that grinding of the ore upto -80 # liberated over 89% of chromite. However, presence of excessive amounts of fines inhibited the flotation. The ore, initially containing 38% Cr₂O₃, was upgraded to concentrates assaying Cr₂O₃ upto 60% with an overall Cr₂O₃ recovery of 82%.

Keywords: beneficiation, cationic flotation, disodium *n*-octadecyl sulfosuccinamate, chromite ore, Pakistan chromite, low-grade chromite

Studies on the Adsorption of Copper (II) by Activated Charcoal and its Application in the Treatment of Textile Industry Effluents

Hajira Tahir^a, M. Nasiruddin Khan^{*a} and Anila Sarwar^b

^aDepartment of Chemistry, University of Karachi, Karachi-75270, Pakistan

^bFuel Research Centre, Pakistan Council of Scientific & Industrial Research, Karachi, Pakistan

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Abstract. The adsorption of divalent copper ions on activated charcoal was studied as a function of pH, amount of charcoal and the concentration of copper ions to optimize the operational conditions for the removal of copper ions using activated charcoal. The cross-interferences with other ions or matrix components of the textile industries effluents were also investigated. The applicability of Freundlich and Dubinin-Radushkevich equations for the said system was tested. Thermodynamic parameters, such as free energy change (ΔG), enthalpy change (ΔH), and entropy change (ΔS) during the adsorption were computed. The treatment of textile industries wastes, containing higher concentrations of copper ions, has been evaluated using activated charcoal based on adsorption technique. The overall performance of the treatment system indicated that activated charcoal can be utilized as a potential decontaminant for the removal of copper ions from textile effluents before discharge into the hydrosphere.

Keywords: adsorption isotherms, activated charcoal, textile industries waste, copper ions removal, industrial effluents, wastewater treatment

Biomagnification of Some Heavy and Essential Metals in Sediments, Fishes and Crayfish from Ondo State Coastal Region, Nigeria

S. S. Asaolu* and O. Olaofe

Department of Chemistry, University of Ado-Ekiti, Ado-Ekiti, Ekiti State, Nigeria

(received September 29, 2003; revised March 19, 2005; accepted March 21, 2005)

Abstract. The biomagnification levels of some essential (Fe, Zn, Cu) and toxic metals (Pb, Ni, Cd, Cr, Co, Mn) were determined in sediments, three kinds of fish (*Oreochromis niloticus*, *Synodonthis* sp., and *Clarias gariepinus*), and crayfish from the Ondo State coastal region. The metal biomagnification in the fish and crayfish was several times greater than in water, while that in the sediments was several thousand-folds greater than in both the organisms and water. Among the metals examined in water, Fe was the most abundant with average values of 146.7 and 74.3 mg/l, respectively, for wet and dry seasons, while Co was the least with average values of 2.4 and 1.6 mg/l. In the sediments, concentrations of Pb, Ni, Fe, Cr, Co and Mn in the wet season were relatively higher than those obtained for the dry season. Fe with an average of 50.9 mg/kg in *C. gariepinus* was the most abundant metal in the fish samples, while Cu with an average value of 0.3 mg/kg in *O. niloticus* was the least. The metal biomagnification for most of the metals for both seasons was found to vary widely from one location to the other. This was confirmed by the coefficient of variation that ranged from 31% to 144% and 29% to 130% in the wet and dry seasons, respectively. The present study has shown that fish, crayfish and sediments can be used to monitor the pollution level of metals in the Nigerian coastal water.

Keywords: metal biomagnification, heavy metals, sediments, crayfish, metal pollution, metal accumulation in fish

Indoor NO₂ Sampling in a Large University Campus in Benin City, Southern Nigeria, Using Palmes Diffusion Tubes

E. E. Ukpebor*, **Y. T. Sadiku**, and **S. I. Ahonkhai**
Chemistry Department, University Of Benin, Benin City, Nigeria

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Abstract. Monitoring of NO₂ in different indoor environments (without cooking and with cooking using different fuels) was done. Palmes diffusion tubes were used for the monitoring. The sampling duration was two weeks. The highest NO₂ concentration of 38.61 ppb (73.74 µg/m³) was monitored in the room where the cooking was done with a gas burner. This was followed by the room with firewood cooking, where the concentration was 36.75 ppb (70.19 µg/m³) and the least concentration of 24.05 ppb (46.80 µg/m³) was noted in the room, where kerosene stove was used for cooking. It is of significance to observe that the WHO annual average guideline value of 40 µg/m³ was exceeded in all the rooms where cooking was done. Levels obtained in this study, therefore, suggest a need for precautionary mitigation. However, the outdoor concentration of NO₂ was almost the same as that obtained indoors in the rooms without cooking. This suggests high penetration indoors of outdoor NO₂. A background level of 3.40 ppb (6.49 µg/m³) was established for the environment in Ugbowo, Benin City, Nigeria.

Keywords: indoor No₂, outdoor No₂, cooking fuels, nitrogen dioxide, air pollution, Palmes diffusion tubes

Short Communication

Quantitative Determination of Sinensetin in *Orthosiphon stamineus* Leaves by Thin-Layer Chromatography and Imaging Densitometry

M. Amzad Hossain^{*ab}, Zakri Zakaria^a and Zhari Ismail^a

^a School of Pharmaceutical Sciences, University Sains Malaysia, 11800 Pulau Pinang, Malaysia

^b Chemistry Division, Atomic Energy Centre, GPO Box No. 164, Ramna, Dhaka-1000, Bangladesh

(received August 27, 2003; revised November 25, 2004; accepted December 04, 2004)

Abstract. An analytical method for the determination of sinensetin in *Orthosiphon stamineus* leaves by a thin-layer chromatography-imaging densitometric method was developed. The procedure consisted of extraction of dry leaf powder with 50% methanol and high performance preparative thin layer chromatography (HPTLC). HPTLC was performed on silica gel plate, using chloroform-ethylacetate (60:40) as the developing solvent for sinensetin. The plate was scanned with a reflectance densitometer at 190 nm. The quantification was done by the external standard method.

Keywords: *Orthosiphon stamineus*, sinensetin quantification, sinensetin extraction, reflectance densitometry

Short Communication

Effect of Storage on the Physicochemical Properties of Palm Oil

F. O. Abulude*, M. O. Ogunkoya and O. S. Eluyode

Department of General Studies, Federal College of Agriculture, Akure-340001, Ondo State, Nigeria

(received June 19, 2003; revised November 18, 2004; accepted January 24, 2005)

Abstract. The effect of 4-month storage on the physicochemical properties of palm oil stored in earthenware pots, plastic and tin containers is reported. Significant increase was noted in the iodine value (tin, from 48.22 to 57.95; plastic, from 48.22 to 56.68) free fatty acids (tin, from 0.65 to 0.93 %; plastic, from 0.65 to 0.93 %), and peroxide value (tin, from 5 to 8.07 mEq/kg; plastic, from 5 to 7.87 mEq/kg) of the oil during the period of storage. The increase was even more pronounced in the earthenware pot in iodine value (from 48.22 to 60.91), free fatty acids (from 0.65 to 0.95%), and peroxide value (from 5 to 8.40 mEq/kg). The sensory quality characteristics were adversely affected during storage in the earthenware pots after 4th month of storage. The results suggest that plastic was the best storage container for palm oil.

Keywords: oil storage, physicochemical properties, earthenware pot, plastic container, tin container

Hybridization Studies in Normal and Cracked-Skull Diseased African Catfish, *Clarias gariepinus*

O. Fagbuaro^{*a}, J.I. Awopetu^b, M.A. Faluyi^c and P.O. Aluko^d

^aDepartment of Zoology, University of Ado-Ekiti, PMB 5363, Ado-Ekiti, Nigeria

^bDepartment of Zoology, Obafemi Awolowo University, Ile Ife, Nigeria

^cDepartment of Plant Science and Forestry, University of Ado-Ekiti,
PMB 5363, Ado-Ekiti, Nigeria

^dNational Institute for Freshwater Fisheries Research, PMB 6006,
New Bussa, Nigeria

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A Comparative Study of the Food and Feeding Habits of *Chrysichthys nigrodigitatus* and *Brycinus nurse* in a Tropical River

C. G. Oronsaye* and F. A. Nakpodia

Zoology Department, University of Benin, Benin City, Nigeria

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Abstract. A comparative study of food and feeding habits of two fish species, *Chrysichthys nigrodigitatus* (Lacepede) and *Brycinus nurse* (Ruppel) was carried out in the Ethiope, a tropical river. Fish species were procured from fishermen, using cast-nets, fish traps, hooks and lines for fish catch. Specimens were chilled with ice-blocks in a heat-insulated cooler and transported to the laboratory at the University of Benin for analysis. One hundred fish specimens were examined and their stomach contents analysed. Two methods were applied for the analysis, namely, the frequency of occurrence method and the volumetric method. The result of the analysis showed that *C. nigrodigitatus* was an omnivorous detritivore, while *B. nurse* was a herbivore. Thus, they occupied different ecological niches and hence were found in abundance in the same water body.

Keywords: food/feeding habits, fish species, tropical river, *Chrysichthys nigrodigitatus*, *Brycinus nurse*, Ethiope river

Biological Evaluation of Extracts and Triterpenoids of *Euphorbia hirta*

M. Abu-Sayeed*^a, M. Abbas Ali^b, P.K. Bhattacharjee^b, Anwarul Islam^b, G.R.M. Astaq^b,
Mohal Khan^c and Sharmina Yeasmin^c

^aDepartment of Applied Chemistry and Chemical Technology, Rajshahi University, Rajshahi-6205, Bangladesh

^bDepartment of Chemistry, Rajshahi University of Engineering and Technology, Rajshahi-6204, Bangladesh
^cBCSIR Laboratories, Rajshahi-6206, Bangladesh

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Abstract. Antibacterial and antifungal activities of crude extracts and two triterpenoids, taraxerone (EH-1) and 11 α , 12 α -oxidotaraxerol (EH-2) isolated from the plant *Euphorbia hirta* were tested against fourteen pathogenic bacteria and six fungi. Crude extracts and pure compounds exhibited significant activity against most of the bacteria tested. On the other hand, all the crude extracts and pure compounds were active, but not significant enough, against most of the tested fungi. The minimum inhibitory concentrations (MICs) of the isolated compounds were also determined against the tested organisms (10^7 cells/ml) and the effective values were found to be between 64-128 μ g/ml. In the brine shrimp lethality bioassay, the compounds were screened for their probable cytotoxic activity, and the LC₅₀ values of EH-1 and EH-2 were found to be 17.78 and 10 μ g/ml, respectively.

Keywords: *Euphorbia hirta*, triterpenoids, brine shrimp lethality bioassay, antibacterial activity, antifungal activity, taraxerone, 11 α ,12 α -oxidotaraxerol

Short Communication

Blood Clotting Effect of Leaf Extracts of *Bryophyllum pinnatum*

J. M. Okuo* and I. M. Ejimadu

Chemistry Department, Faculty of Science, University of Benin, Benin City, Nigeria

(received February 20, 2003; revised December 9, 2004; accepted December 13, 2004)

Abstract. Clotting time of blood samples drawn from eight patients was determined using three variants of plant extracts (crude, aqueous and chloroform) of the leaf of *Bryophyllum pinnatum*. These extracts clotted the test blood samples faster than the untreated blood samples, which ranged between 0.34-3.27 min. Blood samples pretreated with heparin (anticoagulant) did not clot, to any extent, when treated with the *B. pinnatum* extracts. All the test blood samples showed different clotting times. The clotting efficiency of the different extracts was crude > aqueous > chloroform > control. The clotting time for different test blood samples, not treated with any variant of the plant extracts (control samples), ranged between 10.363 ± 0.012 and 14.483 ± 0.008 (min). Normal blood clotting time is between 6-10 min, which may indicate deficiencies in one or more clotting factors in the untreated test blood samples drawn from the study subjects.

Keywords: blood clotting, *Bryophyllum pinnatum*, anticoagulant

Short Communication

Development of Stabilized Vegetable Amylases for Enzymatic Desizing of Woven Fabric with Starch Containing Sizes

S. Ishrat Ali* and A. Farhan Khan

Department of Applied Chemistry and Chemical Technology, University of Karachi-75270, Pakistan

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Abstract. Investigations have been carried out on the development of stabilized vegetable amylases for enzymatic desizing of woven fabric. Vegetable amylases from barley and germinated mango seeds were extracted and stabilized for industrial use. The desizing of woven cotton fabric was carried out with these amylases. Their desizing performance was also compared with commercially available enzymes. As a result of this study, highly active and stabilized amylases were obtained from barley and germinated mango seeds. The method used for the enzyme recovery was also noted to give good yield from both the sources of plant origin.

Keywords: barley amylase, germinated mango seed amylase, desizing enzyme, enzyme stabilization, woven fabric

Effect of Part Replacement of Mercaptobenzothiazole with Locust Bean Cake on the Thermal and Electrical Conductivities of Natural Rubber Vulcanizates

B.F. Adeosun*^a, A.E. Oyeleke^a and E.G. Olumayed^b

^a Science Technology Department, Federal Polytechnic, PMB 5351, Ado-Ekiti, Nigeria

^b Lems Department, Ondo State Polytechnic, PMB 1019, Owo, Nigeria

(received April 18, 2003; revised September 7, 2004; accepted January 24, 2005)

Abstract. The effect of part replacement of mercaptobenzothiazole (MBTS) with locust bean cake (LBC) on the thermodynamic parameters, thermal and electrical conductivities of natural rubber (NR) composite, was examined. Generally, all the thermodynamic parameters, the thermal conductivity and the electrical conductivity of the NR vulcanizates were altered on the inclusion of the MBTS/LBC mix in the formulations of the composites. The degree of alteration of these properties increased with increasing LBC contents in the MBTS/LBC mix. It appears that upto 50/50, MBTS/LBC mix, the lower the entropy change of the molecules of the composite, the higher was the crosslink density of the composite, and the better was the ability of the composite to conduct heat and electricity. It is, therefore, advantageous to replace MBTS with LBC upto 50% in the formulations of NR composites for improved thermal and electrical insulation.

Keyword: mercaptobenzothiazole, locust bean cake, natural rubber, thermodynamic parameters, rubber vulcanizates

Factors Affecting the Geometric and Tensile Properties of Stretch-Knitted Cotton Fabrics

S. Muhammad Nawaz*, Assad Farooq, Babar Shahbaz and Ghulam Murtza

Department of Fibre Technology, University of Agriculture, Faisalabad, Pakistan

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Abstract. The present paper attempts to investigate the effect of elastane concentration and knitting processing variables, such as tightness factor and take-down tension upon spirality and density of rib and single jersey fabrics. Five different concentrations of elastane (0-7%), three different take-down tensions (2, 3 and 5 kg) and four levels of tightness factors (12, 13.5, 15, and 16.5) were selected. Fabric density has a direct relationship with the concentration of elastane and tightness factors. Weight of both types of knitted fabrics increased with the increase in the tightness factor and the percentage of elastane. It was also found that with the increase in take-down tension and reduction in the tightness factor, the spirality increased.

Keywords: knitted fabrics, spirality, elastane, tightness factor, fabric strength

Castor Oil: A Vital Industrial Raw Material

D. S. Ogunniyi

Department of Chemistry, University of Ilorin, Ilorin, Nigeria

(received September 2, 2002; revised September 20, 2004; accepted December 12, 2004)

Abstract. Even though castor oil is inedible, it has for long been an article of commerce. This is in large measure due to the versatility of the oil. This review discusses the extraction of castor oil and its refining methods, while emphasis is placed on the review of the industrial applications of the oil. Since castor oil is not edible, it could be substituted in many industrial application areas where edible oils are used. An awareness of the various applications of the oil can be used to emphasize the need for an increase in its production as a vital raw material for the chemical industries.

Keywords: castor oil, raw material, industrial oil
