

Physical Sciences Section

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PARTICLE SIZE DETERMINATION BY LIGHT SCATTERING IN STREAMING SYSTEMS

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(Received January 23, 1974; revised June 24, 1974)

Abstract. Light scattering by nonspherical particles which are oriented by streaming, furnishes a method for investigating the size and shape of the scattering materials. A new experimental technique used for this investigation is the measurement of the change in the intensity of the light scattered by anisometric colloidal particles when they are oriented by a velocity gradient. The systems investigated consist of suspensions of β -FeOOH crystals. The estimated lengths are found to be within the expected value as determined independently by electron microscopy.

EQUILIBRIUM AND KINETIC STUDIES ON BRILLIANT GREEN

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(Received March 28, 1974; revised July 23, 1974)

Abstract. A neutral aqueous solution of Brilliant Green is of intense green colour. The solution is slowly decolorized as the dye cation is changed to a colourless species due to hydration. The rate constant for the hydration step is $k_1 = 0.354 \times 10^{-3}$ sec. On adding hydrochloric acid solution to a freshly prepared Brilliant Green solution, it turns yellow as the Brilliant Green cation is protonated. The equilibrium between green and yellow species is established instantaneously. The equilibrium constant K for the protonation of the dye cation is found to be $140.5/M$. The yellow species is unstable in acidic solution and it is hydrated at a faster rate to produce a colourless species. The rate constant determined with varying concentrations of the acid, lies in the range 4.62×10^{-3} sec to 5.88×10^{-3} sec. The rate of decolorization in this step is about 13–16 times faster than in the neutral solution. The rate constant k_3 for decolorization of Brilliant Green in sodium hydroxide is found to be 29–37 times faster than the decolorizing rate in neutral aqueous medium. The measurements for the equilibrium constant and the three rate constants were made spectrophotometrically.

MECHANISTIC STUDY OF DEBROMINATION OF SUBSTITUTED CINNAMIC ACID DIBROMIDES WITH IODIDE ION IN AQUEOUS ETHANOL

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(Received May 7, 1974)

Abstract. The debromination of erythrocinamic acid dibromide and its *p*-chloro, *p*-nitro, *m*-nitro and *p*-methoxy analogues with iodide ion in 80% aq. ethanol was studied. The debromination was found to obey the second order kinetic law, being first order in the concentration of each reactant. The observed rate for the debromination of *p*-chlorocinnamic acid dibromide was found to be nearly the same as that of erythrocinamic acid dibromide, the rate of *p*-nitro and *m*-nitrocinnamic acid dibromides was found to be nearly half of the erythrocinamic acid dibromide in each case and the rate of *p*-methoxycinnamic acid dibromide was about 450 times faster at 15°C than that of erythrocinamic acid dibromide at 30°C. The various changes in the rates of debromination of differently substituted cinnamic acid dibromides throw light on the mechanism of the reaction in connection with the existence of the synchronous and nonsynchronous transition state during the reaction. Activation parameters are reported.

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STRUCTURE AND C-13 NMR SPECTRUM OF CADABINE

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Abstract. Cadabine a compound isolated from the leaves of *Cadaba fruticosa* has been identified as stachydrine and its C-13 NMR studied.

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MICRODETERMINATION OF NITRITE IN PRESENCE OF NITRATE

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(Received December 29, 1973; revised May 8, 1974)

Abstract. *N*-Bromosuccinimide has been used for the estimation of nitrite. An excess of *N*-bromosuccinimide was used and then the residual amount was back titrated against standard sodium thiosulphate. The method was quite precise and accurate, the maximum standard deviation being 0.05 mg when a 3.4 mg sample was titrated.

Special Paper

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THE FLOATING SPHERICAL GAUSSIAN ORBITAL (FSGO) MODEL OF MOLECULAR STRUCTURE

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(Received October 3, 1973)

Abstract. The floating spherical gaussian orbital (FSGO) model uses localized closed-shell orbitals for arriving at geometries and energies for singlet ground electronic states for atoms and molecules. The orbitals are allowed to interpenetrate—change positions with respect to the orbital exponent and the space coordinates of the orbital centre.

The FSGO model is *ab initio* with no semi empirical parameters involved. The results obtained through this method are interpretable in terms of the classical Lewis 'electron pair' structures, and the method is, therefore, intuitively appealing to the chemist's viewpoint.

Short Communication

PREPARATION OF 1-BROMO-4-METHYL- PENT-3-ENE

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Biological Sciences Section

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STORAGE EFFECT ON TEPA-TREATED SPERMS IN MALES AND FEMALES OF THE RED FLOUR BEETLE, *TRIBOLIUM CASTANEUM* HBST. (COI: TENEBRIONIDAE)

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(Received July 23, 1973; revised July 20, 1974)

Abstract. The effects of storage of tepa-treated sperms in untreated females and the effect of delayed matings of treated males on the resultant frequency of dominant lethal mutations were investigated. The genetic damage increased when sperm were stored in untreated females. Whereas in sperm from treated males the genetic damage varied with time. The fertility of celibate males varied with time after treatment in a manner similar to those mated immediately after treatment. The sperm from tepa-treated males negated the normal sperms and no residual effect in untreated females mated with tepa-treated males was observed. Some secondary effects of tepa in males have been suggested.

In several species of coleoptera¹⁻³ and diptera⁴⁻⁷ to a residual film of tepa applied to petridishes at

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RELATIVE ABUNDANCE OF DACUS CUCURBITAE AND DACUS CILIATUS IN COMMON HOSTS*

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(Received January 31, 1974; revised April 15, 1974)

Abstract. Studies were carried out on the relative abundance of *Dacus cucurbitae* Coquillett and *Dacus ciliatus* Loew among common hosts like *Citrulus vulgaris* var. *flstulosus* Stocks, *Cucumis melo* L., *Cucumis sativus*, L., *Luffa aegyptiaca* Miller and *Momordica charantia*, L. The data collected from 1970 through 1972 clearly demonstrated the dominance of *D. ciliatus* over *D. cucurbitae*.

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**MATING COMPETITIVENESS OF RADIO-STERILIZED MALES OF THE GRAIN
WEEVIL, SITOPHILUS GRANARIUS L. (COL: CURCULIONIDAE)**

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(Received October 22, 1973; revised March 26, 1974)

Abstract. Virgin males of *Sitophilus granarius* L. were irradiated with two sterilizing doses of gamma-radiation and their mating competitiveness studied. The sterilized males competed equally with normal males during their life time, but 100% 16 krad irradiated males and 94%, 8.1 krad-treated males died in the second week after treatment.

BIOECOLOGICAL STUDIES OF AMRASCA DEVASTANS (DISTANT) ON OKRA (ABELMOSCHUS ESCULENTUS) IN KARACHI PAKISTAN*

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(Received May 25, 1974; revised July 16, 1974)

Abstract. The biology of *Amrasca devastans* (Distant) was studied on okra (*Abelmoschus esculentus*) leaves under laboratory conditions, to determine the growth, longevity and reproduction of the leafhopper. Studies were also made on the incubation period and oviposition potential of females. These studies have revealed that this species is capable to feed and breed on at least nine plant species. At a temperature range of 80–89°F, it survives for 9–37 days, and can lay on the average 17.7 eggs per female. The eggs have an average incubation period of 8.4 days. The nymphal period on the average lasts for 11.1 days. Total nymphal mortality of the leafhopper in laboratory was 12.1%. The species breeds to extremely huge numbers on okra and mostly feeds on the leaves rendering them dead very soon. The results fairly agree with Afzal and Ghani² and Saxena and Saxena,¹⁰ but differ in some details.

DIFFERENTIATION OF THE VARIETIES OF CYMBOPOGON ON THE BASIS OF ITS CHEMICAL CONSTITUENTS

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(Received July 17, 1973; revised July 20, 1974)

Abstract. A number of species of the genus *Cymbopogon* were grown at the nursery of the department. Their free amino acids, lipids and phenol contents were studied by chromatographic methods. Although some relationship was shown in different species no definite differentiation was possible on chemical basis alone.

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SOME PROPERTIES OF THE VIRUS CAUSING PAPAYA MOSAIC FROM PAKISTAN

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(Received July 15, 1974)

Abstract. Papaya mosaic virus was transmitted by mechanical inoculation from *Carica papaya* L. to young papaya seedlings where it caused systemic mosaic and leaf curl symptoms, and to *Glycine max* (L.) where it caused few chlorotic lesion on inoculated cotyledons and systemic mosaic symptoms developed later. Local lesions were produced on *Chenopodium quinoa* Willd. Which was used as an assay plant. In crude sap, virus was inactivated at 55°C for 10 min and stood for dilutions of 1:10,000. The virus had a wide range of pH and inactivated after 3 days at 25°C.

Technology Section

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EFFECT OF HEAT ON THE IN VITRO DIGESTIBILITY OF FISH PROTEIN

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(Received May 7, 1974; revised July 10, 1974)

Abstract. The enzymic digestion of raw as well as heated fish protein prepared from fatty and non-fatty samples was carried out with pepsin, trypsin and the enzymes present in ox-pancreas. The effect of lipid oxidation products, produced during heating of fish protein, on the proteolytic enzymes was determined by estimating free amino acids of whole and defatted samples after 3, 6, 9 and 24 hr. The digestibility of fish protein varied with the variety of fish, nature of enzyme and the type of heat treatment. Extraction of lipids with chloroform-methanol raised the digestibility of all the samples.

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EFFECT OF GAMMA RADIATION ON THE PHYSICOCHEMICAL COOKING AND ORGANOLEPTIC CHARACTERISTICS OF RICE

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(Received April 2, 1974; revised July 30, 1974)

Abstract. Gamma irradiation (10–1000 krad) of Basmati-370 and IR-8 varieties of rice did not cause any change in any physicochemical parameters except sugars which increased at higher doses of radiation. Swelling number (98°C), elongation ratio and starch-iodine blue value were decreased by irradiation while water uptake (77°C) and loss of total solids in the residual liquid were increased. Organoleptic evaluation of cooked rice clearly demonstrated that irradiation up to 50 krad dose level had no adverse effect on the sensory characteristics of rice but higher doses caused browning of rice kernels, off-flavour and texture deterioration.

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EFFECTIVENESS OF SOME MUCILAGINOUS SEEDS AS BIOLOGICAL CONTROL AGENTS FOR MOSQUITO LARVAE

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(Received July 28, 1973; revised June 24, 1974)

Abstract. Thirty seeds, belonging to seventeen different families, which are commonly available in Pakistan, were tested for the production of mucilage in water and the trapping of mosquito larvae. *Ocimum pilosum*, *Ocimum gratissimum*, *Lallemantis royelleana* and *Salvia spinosa* proved to be the most effective ones. Most of the seeds tested in this experiment are nonpoisonous and of medicinal importance. These findings can be used as alternate to the chemical control agents to destroy the mosquito larvae and hence prevent water pollution.

TOXICITY OF NEMOKIL, A PETROLEUM BY-PRODUCT AGAINST WHITE RATS

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(Received June 2, 1973; revised July 5, 1974)

Abstract. The toxicity of Nemokil to white albino rats was measured. The oral LD₅₀ value was found to be 14,200 mg/kg body weight. It showed no toxic effects on dermal application at 20,000 mg/kg or subcutaneously at 50,000 mg/kg body weight.

EFFECT OF SALINITY ON THE GROWTH AND MINERAL UPTAKE IN SOY BEAN (GLYCINE MAX)*

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(Received January 24, 1974; revised April 15, 1974)

Abstract. Soy bean was grown in full and half-strength Hoagland solution in 4-litre plastic containers. This species was found to be highly sensitive to salinity and even at the lowest level of salinity (2 atm) the plant growth was severely affected. The chemical analysis showed that the concentration of N, Ca and K was reduced under saline condition while that of P and Na underwent a significant increase. When additional quantities of Ca or Mg were added to the nutrient solution it was observed that both Ca and Mg had no significant affect in increasing the salt tolerance in soy bean.

STUDIES ON THE EFFECT OF PARTICLE SIZE ON THE UPGRADING OF CHROMITE FROM DARGAI AREA (PAKISTAN). PART I

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(Received November 22, 1973)

Abstract. Studies have been made by physical methods to see the effect of particle-size reduction for upgrading the chromite of Dargai area. The physical analyses have shown that liberation of chromite from the gangue material occurs in the finer fraction. 114μ is the most suitable grain size for beneficiation of chromite of this area. All these results have been confirmed by chemical analysis.

THERMAL NEUTRON ACTIVATION ANALYSIS OF SAUDI ARABIAN IRON ORES

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(Received January 10, 1974; revised May 2, 1974)

Abstract. Fe, Na, Sc, Cr, Co, Br, Sb, La, Sm, Tb, Lu, Th, and U in Saudi Arabian iron ores were determined using the instrumental neutron activation analysis. Gamma-ray activities, were measured by a Ge(Li) detector coupled with a 4096-channel pulse-height analyser. The amounts of Fe, Cr, and Sb were found to be Fe, $51.3 \pm 0.6\%$; Cr, 276 ± 13 p.p.m. and Sb, 1.59 ± 0.21 p.p.m.

**PRELIMINARY REPORT ON THE GEOLOGY OF THE MIDDLE PART OF AMBELA
GRANITIC COMPLEX, LOWER SWAT, PAKISTAN**

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(Received November 17, 1973; revised April 10, 1974)

Abstract. Geological map and petrographic and field descriptions of various rock-types of the middle part of the Ambela granitic complex and the associated rocks are presented. Basing upon the structural relationships between various kinds of rocks, it is inferred that both the granitic and metasedimentary rocks were involved in a single tectonic event, whereas the unsheared syenitic rocks represent a post-tectonic phase of igneous activity in the area.

AKORA KHATTAK CLAYS OF NOWSHERA TEHSIL

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(Received January 10, 1974)

Abstract. The clays found near Akora Khattak, about 35 miles east of Peshawar, on the left bank of Kabul River, are illite with subordinate amounts of free quartz, feldspar, mica and heavy minerals. The angular to subrounded nature of clastic grains and their composition indicate that acid igneous rocks of Malakand and Lower Swat are probably the source rocks. X-ray, DTA and chemical analyses data are given.

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STUDIES ON REDUCTION OF ZIARAT LATERITE

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Abstract. Laterite from Ziarat contains the useful constituents iron, alumina and titania. There are various methods which can be used for the separation of these constituents. To explore a possibility low-temperature reduction has been used in the present investigations. Reduction has been carried out from haematite to magnetite or iron and, subsequently, the magnetic material separated by magnetic separation. Concentrations having 59% Fe_2O_3 with 96% recovery of iron and 75% Fe_2O_3 with 76% recovery of iron were achieved in the form of Fe_3O_4 and Fe respectively.

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GEOLOGICAL INTERPRETATION OF THE MAGNETIC MEASUREMENTS IN PACHINKOH-LUFTO IRON ORE PROSPECTS

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(Received April 20, 1974)

Abstract. Magnetic measurements were carried out in Pachinkoh-Lufto areas, 50 miles northwest of Nokundi District Chagai, Baluchistan, to delineate the subsurface distribution, attitude and structure of the magnetite-hematite lenses reported from these areas. Eight sites for test-drilling were recommended on the basis of the interpretation of the vertical magnetic-intensity anomaly map. Three of the recommended sites have been drilled. The geological interpretation of the magnetic data supported by test drilling results are discussed in this report.

The geological and geophysical investigations quartz chalcedony chlorite and calcite Magnetite

PHYSICAL PROPERTIES OF SPECTACLE GLASS AS A FUNCTION OF THE CATION SIZE

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(Received March 11, 1974; revised May 8, 1974)

Abstract. Seven soda-potassia-lime-silica glasses were melted with small changes in alkali and alkaline earth content; in three glasses small amounts of MgO, SrO and BaO were introduced. The densities and refractive indices were determined, the specific refractivity dispersion and polarisation constants were calculated and related to the size of the cations.

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DESULPHURISATION OF CALCIUM SULPHIDE

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Abstract. The decomposition of calcium sulphide with steam has been studied for different temperatures with a view to develop a process for the recovery of sulphur. The effect of varying particle size, reaction period, temperature and steam flow has been investigated. The maximum total recovery of sulphur as H_2S by steam was about 60%.

Special Paper

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A REVIEW OF MEDULLATION IN WOOL

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Special Paper

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TECHNIQUES FOR STUDYING ADSORPTION OF VAPOURS ON LOW SURFACE AREA SOLIDS

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(Received December 20, 1972; revised July 4, 1974)

Abstract. Some specialized volumetric and gravimetric techniques successfully used for studying adsorption of vapours on low-surface area solids, have been reviewed alongwith the necessary precautions to be taken during the experimental work. The piezogravimetric method has been evaluated in particular stating its merits, demerits and limitations.