Physical Sciences Section

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ADSORPTION OF ARGON AND n-ALKANES ON MASSIVE SOLID SURFACES

G. M. KHAN

Department of Chemistry, University of Victoria, Victoria, British Columbia, Canada

(Received June 23, 1971; revised August 7, 1971)

Abstract. Piezogravimetric method has been used to study the adsorption of n-hexane on quartz crystal surface and of argon, n-hexane, n-heptane and n-octane on silaned-quartz crystal surface, at 26.7°C. All the isotherms are of type II, indicating multilayer adsorption, while small extrapolations in some cases indicate that the physical adsorption at high pressures is not necessarily infinite. The values for the surface area of the silaned-quartz surface and the cross-sectional areas of n-alkanes used have been calculated and compared with the values found in the literature.

A COMPARISON OF THE SPIN DENSITY MATRIX ELEMENTS OF K* (892) and N* (1236) RESONANCES PRODUCED IN 5 GeV/c K+p INTERACTIONS WITH PREDICTIONS OF THE ABSORPTION MODEL

S.S. Huo[†] and M. Jobes

Department of Physics, University of Birmingham, Birmingham 152TT, England

(Recevid April 24, 1971; revised October 12, 1971)

Abstract. The reaction $K^+p \to K^+p \pi^+\pi^-$ at 5 GeV/c proceeds predominantly via the production of K^* (892) and N^* (1236) resonances. The spin density matrix elements ρ_{00} , ρ_{1-1} and $Re \, \rho_{10}$ of the K^* (892) resonance and ρ_{33} , $Re \, \rho_{3-1}$ and $Re \, \rho_{3}$, of the N^* (1236) resonance were determined in five regions of four momentum transfer from the target proton to the outgoing $p\pi^+$ system ($\triangle^2p\to p\pi^+$) by fitting the resonance decay angular distributions using a maximum likelihood method. The variation of the density matrix elements with \triangle^2 agree reasonably well with the predictions of the absorption model.¹

IMINE-ENAMINE TAUTOMERISM IN HARMALINE

ATTA-UR-RAHMAN and TAYYABA BURNEY

Postgraduate Institute of Chemistry, University of Karachi, Karachi 32

(Received October 7, 1971; revised December 28, 1971)

Abstract. The existence of an enamine tautomer of harmaline, in equilibrium with the imine form, has been demonstrated by NMR studies. Rapid deuteration of the exocyclic methyl group of harmaline in tetradeuteromethanol unambiguously established the existence of this equilibrium. The synthetic potentialities of these masked enamine systems has been discussed.

STUDIES ON HETEROCYCLICS

Part 2. Bromination of some Benzimidazole Derivatives

M.K.A. KHAN, AMINA MOHAMMADY and FAUZIA Y. AHMED

PCSIR Laboratories, Karachi 39

(Received July 23, 1970; revised April 5, 1972)

Abstract. Bromination of 2-methylbenzimidazole with bromine in chloroform gave 2-methyl-5(6)-bromobenzimidazole and 2-methyl-4,6(5,7)-dibromobenzimidazole. Bromination with *N*-bromosuccinimide gave only 2-methyl-5(6)-bromobenzimidazole. Bromination of 2-carboxybenzimidazole gave 2-carboxy-5(6)-bromobenzimidazole.

COMPARATIVE STUDIES OF CHEMICAL SHIFT AND THE SOLVENTS EFFECT OF THE N-METHYL GROUPS BY NMR SPECTROSCOPY

S.S.H. Zaidi, M. Afroz Khan and A.H.K. Yousufzai

PCSIR Laboratories, Karachi 39

(Received February 16, 1971; revised May 1, 1971)

Abstract. NMR spectrometer has been used for the characterisation of *N*-methyl groups. The method depends on the decreased shielding of *N*-methyl protons. The decreased shielding results in a downfield shift of the *N*-methyl resonance, depending upon the type of compounds. Experimental evidences show *N*-methyl variations from 1.88 to 4.10 p.p.m.

Solvent shifts of N-methyl groups have also been studied and variations have been found both in aromatic and nonaromatic solvents. In aromatic solvents such as pyridine and benzene, the range of solvent shift varies from 0.03 to 0.85 p.p.m. In nonaromatic solvents, variation is not more than 0.20 p.p.m. Solvent shifts in deutero mixture of (a) chloroform and pyridine, (b) chloroform and benzene, (c) chloroform and dimethyl sulfoxide, have also been studied and interesting results were obtained.

SYNTHESIS OF A NEW HYDROCARBON 6.12-DIHYDROANTHANTHRENE

YASMEEN BADAR, KANEEZ FATIMA and M.S.H. SIDDIQUI

PCSIR Laboratories, Karachi 39

M.E. HAMDARD

Postgraduate Institute of Chemistry, Karachi University, Karachi 32

(Received June 17, 1971; revised July 26, 1971)

Abstract. A new polycyclic hydrocarbon 6,12-dihydroanthanthrene has been synthesised from 8,8'-bisbromomethyl-1, 1'-binaphthyl by its reduction with phenyllithium. Characteristic properties of its IR, UV, PMR and mass spectra have been studied.

PROTON MAGNETIC RESONANCE SPECTRA OF SOME 8,8'-SUBSTITUTED-1,1'-BINAPHTHYLS AND RELATED COMPOUNDS

YASMEEN BADAR, KANEEZ FATIMA and S.S.H. ZAIDI

PCSIR Laboratories, Karachi 39

M.E. HAMDARD

Posrgraduate Institute of Chemistry, University of Karachi, Karachi 39

(Received November 19, 1970; revised August 5, 1971)

Abstract. The PMR spectra of 8, 8'-substituted-1, 1'-binaphthyls and related compounds carrying different functional groups as —COOH, —COOCH₃, —CH₂OH, —CH₃, —CH₂Br, —CH₂OCH₃, —CH₂OC₂H₅, —CH₂OCOCH₃ and C=O forming a bridge between 8' and 2 carbon atoms, have been studied. An unusual chemical shift of methyl ester group at 7. 30 in these binaphthyl compounds has been observed. In addition to the unusual chemical shift of the methyl ester group the spectra exhibited also a series of quartet and octet in the region between 7 1.5-3.9. The decreased shielding results in a downfield shift of benzenoid protons depending upon the nature of the substituents in these compounds.

SPECTRAL DATA FOR COPPER(II)-SUCROSE SPECIES IN AQUEOUS ALKALI SOLUTIONS

S.S.M.A. KHORASANI and A.M. SHAFIQUL ALAM

Department of Chemistry, University of Dacca, Dacca 2

(Received January 12, 1971; revised October 14, 1971)

Abstract. Spectral data for copper(II)-sucrose species in aqueous NaOH solutions have been recorded over the range 200-350 nm and the influence of alkali and sucrose concentration, as also effect of sulphate and nitrate ions on the absorption behaviour have been examined. According to the proposed method, absorbance measurement at 246 nm employing 0.1N NaOH and 2% wt/vol sucrose enables one to determine 1.5-13.0 mg of copper in metallic samples, solutions and in mixtures with alkali and alkaline earth metals, chloride, nitrate, chlorate, bromide, iodide, bromate and iodate with an accuracy of \pm 0.2 mg. Absorption behaviour of copper(II) sulphate and the chlorides of chromium(III) and iron(III) in alkaline sucrose solutions have also been briefly examined

STUDIES IN THE ALKALOIDS OF RAUWOLFIA CAFFRA SONDER

Part III. The Structure of Raucaffricine

MOHAMMAD ATAULLAH KHAN

Postgraduate Institute of Chemistry, University of Karachi, Karachi 32

A.M. AHSAN

PCSIR Laboratories, Karachi 39

(Received November 3, 1971)

Abstract. Raucaffricine has been proved to be D(+)-galactoside of vomelenine at C-21 oxygen mainly by its spectral studies and that of its acid hydrolytic constituents. It has further been substantiated by partial enzymic synthesis.

INVESTIGATIONS ON ANDROGRAPHIS PANICULATA NEES

Part VI. The Root Flavones and Their Structures

MD. ERFAN ALI, K.M. BISWAS and SHAMSUL ALAM CHOWDHURY

PCSIR Laboratories, Chittagong

(Received August 24, 1971; revised October 29, 1971)

Abstract. Extraction of the roots of Andrographis paniculata with alcohol has given four flavones. Two of them, andrographin and panicolin, are shown to be 5-hydroxy-2',7,8-trimethoxyflavone and 2',5-dihydroxy-7,8-dimethoxyflavone respectively. The other two flavones are apigenin 4',7-dimethyl ether and mono-O-methylwightin. α_{I-} Sitosterol has also been isolated from the alcoholic extract of the roots.

A MODIFIED METHOD FOR THE DETERMINATION OF ARSENITE WITH COBALT(III) ACETATE

MUHAMMAD HANIF, MUHAMMAD ASLAM CHUGHTAI* and M. ANWAR CHAUDHRI*

PCSIR Laboratories, Lahore 16

(Received April 21, 1971; revised August 13, 1971)

Abstract. A modified, quick and precise method for the quantitative determination of As(III) with cobalt(III) acetate in 1N HCl as medium has been devised. The slow rate of reaction between cobalt (III) and As(III) has been accelerated by the addition of catalysts. Effect of interferences on the reaction has also been studied.

QUANTITATIVE ANALYSIS OF NICKEL BY A MODIFIED METHOD

A.M. QURESHI and Q.U. HUSSAINI

Department of Chemistry, University of Karachi, Karachi 32

(Received April 14, 1971; revised May 10, 1971)

Abstract. Quantitative determination of nickel by back titrating with nickel(II) solution instead of using standard silver nitrate and 10% potassium iodide solutions is as accurate as standard method.

A TECHNIQUE FOR THE DETERMINATION OF FORMALDEHYDE PRODUCED DURING THE PERIODATE OXIDATION OF POLYSACCHARIDES

S.M. HEGAZI

National Research Centre, Dokki, Cairo, Egypt

(Received July 12, 1971)

Abstract. A clarifying method is given for destroying the periodate and iodate from the reaction mixture during the polysaccharides oxidation, to allow accurate measurement of the formaldehyde produced by the chromotropic reagent. Lead acetate and potassium oxalate solutions lead to a successful determination of the formaldehyde. A modified technique has also been developed for the determination of formaldehyde with the phenylhydrazine hydrochloride and potassium ferricyanide solutions.

Short Communication

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ACTION OF THIONYL BROMIDE ON ORGANIC ACIDS

S.D. SARAF, Z.A. MALIK and (Miss) ATHAR ZIA

Institute of Chemistry, University of Islamabad,
Islamabad

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Biological Sciences Section

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DIFFERENTIAL SOLUBILISATION OF THE PROTEINS OF ABRUS PRECATORIUS LINN

RIAZ FATIMA, BILQUIS FARUQUI and A. HAMEED KHAN

PCSIR Laboratories, Karachi 39

M. ATAUR RAHMAN

Jinnah Post Graduate Medical Centre, Karachi

(Received November 5, 1971)

Abstract. The solubilisation of the proteins of the seeds of Abrus precatorius (Linn) by various anions and cations and at different pHs has been studied. Except for the amount of protein extracted the curves for water and buffers show an identical pattern. Cations seemed to have little effect on solubilisation of protein. Slight variations were observed in the proportion of protein extracted with different anions. The physiological properties of these extracts showed that both the toxin and the agglutinin were extracted to almost the same extent. However, the electrophoretic studies revealed that the toxin and the agglutinin belonged to two different protein components.

STUDIES IN THE BIOCHEMISTRY OF MICROORGANISMS

Part XXVI. Structure of Shahenxanthone and Najamxanthone, Metabolic Products of Aspergillus Stellatus Curzi

AHMAD KAMAL, SHAHEEN A. HUSAIN and ASAF A. QURESHI

PCSIR Laboratories, Karachi 39

(Received September 9, 1971)

Abstract. The structure of Shahenxanthone, $C_{25}H_{28}O_7$ and Najamxanthone, $C_{26}H_{28}O_8$; metabolic products of Aspergillus stellatus have been established as 3,4-dihydro-2,7-dihydroxy-3-(I-hydroxy-2- isopropylallyl)-5- (hydroxymethyl) - 2,8-dimethyl - 2H, 6H-pyrano[3,2-b] xanthen-6-one (I) and 3,4-trihydro-2,5,7-trihydroxy-3-(I-hydroxy-2-isopropylallyl)-2,8-dimethyl-2H,6H-pyrano[3,2-b] xanthen-6-one 5-acetate*(II) respectively, through physical methods.

EFFECT OF LIPIDS ON CITRIC ACID PRODUCTION BY ASPERGILLUS NIGER

M.A. BAIG, M.A. QADEER and A. HAMEED NIAZI

PCSIR Laboratories, Lahore 16

(Received May 1, 1971; revised August 9, 1971)

Abstract. Addition of any of the lipids such as peanut oil, soyabean oil, olive oil and almond oil at about 2–10% to a sucrose + NH₄NO₃+ salts medium stimulated citric acid production by Aspergillus niger in shake flasks. Of all oils, soyabean oil gave maximum stimulation. The growth process of Aspergillus niger was sensitive to lipids added during exponential growth phase. The mould morphology was modified to the form of separate small and round pellets with improved aeration and agitation of the culture.

STUDIES ON SHRIMPS OF KARACHI WATERS

Part I. Determination of Food Value and Physicochemical Constants of Fat and Protein

S.A. HAQ and IQBAL H. SIDDIQUI

PCSIR Laboratories, Karachi 39

SHAMSUDDIN QURESHI

Department of Marine Fisheries, Government of Pakistan, Karachi

(Received December 22, 1970; revised January 22, 1972)

Abstract. Eleven varieties of shrimps available at the Karachi Fish Harbour, have been analysed for the determination of physicochemical constants of fats and proteins. No significant differences were noted in the fat content. High acid value has been found in all the varieties. The fat of all the varieties of shrimps seems to be rich in saturated acids. Significant variations were, however, noted in saponification value and also in the nonsaponifiable matters. The muscles of shrimp have practically almost all the amino acids with the exception of cystine and cysteine which have been found in insignificant amounts or traces. However, high amounts of glycine have been estimated.

A STUDY OF AEROBIC BACTERIA AND FUNGI ASSOCIATED WITH BLATTELLA GERMANICA (LINNAEUS), TRIBOLIUM CONFUSUM (JACQUELIN DU VAL), AND POEKILOCERUS PICTUS (FABRICIUS)

RIAZ I. ZUBERI, QAMAR H. EFFENDI and SHAHID H. ASHRAFI

PCSIR Laboratories, Karachi 39

(Received March 30, 1971; revised August 2, 1971)

Abstract. Thirteen species of bacteria were isolated from surface washings, the fat body, and the alimentary tract of Blattella germanica (Linnaeus), and Poekilocerus pictus (Fabricius). Five species of bacteria were isolated from surface washings and macerated adults of Tribolium confusum (Jacquelin du Val). Three major human pathogens were found, Corynebacterium diptheriae gravis was associated with B. germanica; Shigella dysenteriae was associated with B. germanica and T. confusum; and finally Salmonella para typhi A was associated with B. germanica and P. pictus. Only one species of fungus, Penicillium sp., was isolated and this was found associated with all 3 insect species.

SOME MORE GENERA AND SPECIES OF TYPHLOCYBINAE (CICADELLIDAE:HOMOPTERA) FROM EAST PAKISTAN

MANZOOR AHMED

Bioecology Research Project, Department of Zoology, University of Karachi, Karachi 32

(Received March 22, 1971; revised July 8, 1971)

Abstract. Ahmed4 described eleven species under five genera in the tribe Erythroneurini of the subfamily Typhlocybinae in East Pakistan. Prior to this work these leaf-hoppers were known very little, and only through sporadic works of Ghauri, 6,7 Ahmed3 and a few others. The present account is the second in this series and consists of five species under five genera, i.e. Hameedia erythrocephala, new genus, new species, Mahmoodiana acuta Ahmed, Typhlocyba bengalensis, new species, Sylhetia punctata, new genus, new species and Erythroneura verticalis Ahmed.

FRESH WATER FISH TREMATODES OF PAKISTAN

Two New Metacercarial, Forms of Clinostomum Leidy, 1856 (Trematoda)

FATIMA MUJIB BILQEES

Department of Zoology, University of Karachi, Karachi 32

(Received February 13, 1971; revised July 1, 1971)

Abstract. Two new metacercarial forms of the genus Clinostomum Leidy, 1856, namely Clinostomum mujibi and Clinostomum marulius, are described from the fish Ophicephalus marulius (Ham) of Haleji lake, West Pakistan. Clinostomum mujibi is characterised by having distinctly lobed testes, anterior five lobed and posterior larger three lobed, large cirrus sac lateral to the anterior testes, submedian genital pore anterior to anterior testes, well differentiated shell gland complex, long coiled oviduct, seminal receptacle posterolateral to ovary, ovary posterior to anterior testes, uterine sac joining the uterine duct at a distance of 0.95 from the acetabulum, well developed metraterm, and a small postcecal V-shaped excretory vesicle and peculiar arrangement of excretory tubules in the outer surface of body parenchyma. It was recovered from the orbit of host.

Clinostomum marulius from the mesentries of the same fish host is peculiar in having much smaller body with relatively large suckers, delicate uterine sac closer to acetabulum, large slightly lobed or irregular testes, large shell gland immediately anterior to posterior testes and delicate excretory tubules prominent at the periphary, small smooth or slightly irregular ovary lateral to anterior testes, and posterior dilatation of the ceca with irregular outline.

RICE BREEDING WITH INDUCED MUTATIONS

A. J. MIAH, G. MUSTAFA and A.M. SOOMRO

Atomic Energy Agricultural Research Centre, Tandojam

(Received June 30, 1971; revised August 3, 1971)

Abstract. Mutation research was initiated in rice with the following aims: (1) to induce dwarfness in Dokri Basmati and Jajai-77, (2) to compare the effects of gamma rays and fast neutrons on the induction of chlorophyll mutations in IR8 and Mehran 69 (from IR6-156-2) (3) to improve the grain quality of IR8, and (4) to shorten the maturity period of Mehran 69. The preliminary findings are described in this report.

Both gamma-rays and fast neutrons gave rise to short-culm mutants in Dokri Basmati;

early ripening and grain-size mutants in Jajai-77.

In M₃ each of the mutants from both the varieties was found to maintain its mutated characteristics with concurrent changes in some other agronomic traits. These changes occurred in both positive and negative directions. Preliminary yield tests of the M₄ lines showed that one of the short-culm mutants (S-10) of Dokri Basmati and two of the grain-size mutants (large grain-2 and large grain-3) of Jajai-77 retained the parent level of grain yield while in the rest of the mutant lines of both Dokri Basmati and Jajai-77, the grain yield was reduced significantly as compared to their respective parents.

The frequency of M₂ chlorophyll mutations was increased by gamma-rays and fast neutron treatments in both IR8 and Mehran 69. However, the rate of increase was not proportional to doses. The mutagenic efficiency of the two radiations was more or less the same. Mutagenic effectiveness, on the other hand, was generally highest at lower doses.

and that neutron is 10-30 times more effective than gamma-rays.

EFFECT OF RADIATION ON POLLEN AND SPIKELET FERTILITY IN RICE

C.S. SAHA, M. AFSAR AWAN and G. BARI

Radiation Genetics Institute, Lyallpur

(Received April 13, 1971)

Abstract. Dry seeds of rice variety 370-Basmati were exposed to fast neutron doses ranging from 1.0 to 2.5 kR and gamma-rays from 15 kR to 30 kR, and the data on pollen and spikelet fertility were recorded in $M_{\rm I}$ generation. There was a very high negative correlation between the radiation dosage and the fertility on pollen grains and spikelets. Neutrons had more serious effect than gamma-rays.

Special Paper

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A REVIEW ON CHEMICAL AND MEDICINAL ASPECTS OF ALLIUM SATIVUM

M. IKRAM

PCSIR Laboratories, Peshawar

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Short Communications

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CONSTITUENTS OF SAXIFRAGA CILIATA

Part II.* Structure of Saxin

M. Manzoor-i-Khuda

Jute Research Institute, Dacca 15

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THREE NEW RECORDS OF FUNGI FROM PAKISTAN

A. Hussain and M.A.B. Malik

Department of Botany,

University of Karachi, Karachi 32

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Technology Section

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A NOTE ON THE PALAEOMAGNETISM OF THE LOWER SIWALIKS NEAR CHOA SAIDEN SHAH, POTWAR PLATEAU, WEST PAKISTAN

H. WENSINK

Geological Institute of Utrecht State University, Oude Gracht 320, Utrecht, Netherlands

(Received January 17, 1972)

Abstract. Forty oriented hand sample were collected from four layers of red shale at the basal part of the continental detrital rocks of the Muree-Siwaliks formations at the Southern edge of the Potwar Plateau near Choa Saiden Shah in order to see whether these rocks are suitable for a palaeomagnetic research. The samples of three beds show consistent stable directions of magnetization after treatment in alternating magnetic fields. The deviating direction of magnetization of the fourth layer is discussed.

The mean characteristic direction of magnetization obtained from three beds has a D (declination) = 1.4° and an I (inclination) = $+28.1^{\circ}$. The value deviates considerably from the direction of the present geomagnetic axial dipole field at the sampling locality. This preliminary result implies that in Miocene times the Indo-Pakistan subcontinent was still far off

from its present position.

A STUDY ON THE MAGNESIUM SOLONETZ SOILS OF SITAKUNDA, CHITTAGONG, EAST PAKISTAN

Z.H. BHUIYA, A.KARIM and M.S. HOQUE

Department of Soil Science, East Pakistan Agricultural University, Mymensingh

(Received June 30, 1970)

Abstract. The soils under study moved towards higher base saturation with depth showing the podsolic character of the surface horizons. The exchangeable calcium holds the relative dominance over all other ions in the surface horizons of the soils but it is exceeded by exchangeable magnesium in the subsurface horizons. The exchangeable potassium is higher in the A horizons than in the B horizons of the soils.

The exchangeable sodium has assumed a high percentage of the total metal ions showing the sticky consistency of the soils under moist condition, cemented and compacted structure of the A horizons and the solonetz structure of the B horizons of the soils.

The high percentages of exchangeable magnesium and sodium show that in these soils solonization has taken place because of the presence of magnesium and sodium in the salt water creek which flows through that area. Due to the dominance of magnesium in the exchange complex the soils have been termed as magnesium solonetz.

DETERMINATION OF SOIL CREEP IN THE SOIL PROFILES OF MONT ST. HILAIRE, QUEBEC, CANADA

K. A. MALLICK*

Department of Geological Sciences, McGill University, Montreal, Quebec, Canada

(Received April 1, 1971; revised June 24, 1971)

Abstract. Soil profiles developed on six slopes from five different areas of various rocks of Mont St. Hilaire, Quebec, Canada were selected for the determination of soil creep. Marbles were preferred as compared to plastic cylinders and metal pegs for the determination of soil creep in the area of the present project.

The determination of soil creep on these different rock types and slopes shows variable movement in the soil profiles: an average of 9 in per year has been determined for the upper 6 to 8 in of the soil profile. The movement of soil in the B-horizon ranges between 2-4 in.

Maximum movement rate indicate that under present conditions down slope movement is in the order of 312.5 yards since 12,500 years ago in the upper 6-8 in of the soil profile.

SEDIMENTOLOGY OF THE QUATERNARY ALLUVIAL DEPOSITS IN AND AROUND DACCA, EAST PAKISTAN

SYED NEAZ AHMAD*

Department of Geology, University of Dacca, Dacca

MOHD. AZIZUL ISLAM

Geological Survey of Pakistan, Dacca

(Received April 1, 1971)

Abstract. Petrographic and mineralogical studies of the Modhupur Clay of Pleistocene age and the alluvium of the Recent have been carried out. The thick deposits of Modhupur Clay gradually grade from sandy-clay to clayey-sand downward. Statistical analysis of grain-size parameters clearly brings out this change with depth. The alluvium of the Recent is more closely related to the upper part of the Modhupur Clay in its petrogr aphic properties.

The Modhupur Clay and the alluvium differ in their heavy mineral contents, but igneous and metamorphic rocks together with preexisting sedimentary rocks as sources for the two are indicated. The sediments of both the Modhupur Clay and the alluvium are suggested largely to be the product of more than one cycle of erosion. Shape analysis of quartz grains from the two sediments indicates that present day erosion of Modhupur Clay has provided considerable amount of sediments to the alluvium of the area.

Geological evidence and petrographic characteristics of the sediments indicate a shallow-water continental environment of deposition possibly lacustrine or protected bay for the Modhupur Clay which gradually changed to flood plain condition. The alluvium of the Recent is a flood plain deposit.

RHAMNUS PENTAPOMICA AS A NEW SOURCE OF TANNIN.

TAUFEEQ KHAN, MUZAFARUL HAQ and MUMTAZ AHMAD KHAN

PCSIR Laboratories, Peshawar

(Received January 13, 1971; revised May 5, 1971)

Abstract. Rhamnus pentapomica was obtained from Kohat District for studying its tannin content. The different portions of the tree, i.e. wood, bark and leaves, were examined.

CHEMICAL STUDIES OF SUNFLOWER SEED OIL

S.A.H. Naqvi and A.R. Nowshervi

Department of Chemistry, University of Peshawar, Peshawar

(Received April 8,1971; revised June 19, 1971)

Abstract. Chemical investigations were carried out on the oil extracted from three locally grown imported varieties of H.O.I, Mayak, and Armaviriec 3497. Various constants, oleic and linoleic contents were determined in each case. H.O.I. was then hydrogenated and retested, which showed improvement in some of the values, as expected. Three more varieties, Peredovic, Arrowhead and Mingron were also analysed for fatty acids and the amino acid composition. The results are comparable with the fatty acids of cottonseed and soyabean oil, and with slight adjustment the oil may be employed for most of the fatty acid industries. Better quality oil may even be consumed directly as table oil, cooking oil or for conversion to margarine.

STUDY ON THE IMPROVEMENT OF TALC CONCENTRATE

A. M. ABIDO

Laboratory of Metallurgy, National Research Centre, Dokki, Cairo, Egypt.

(Received December 30, 1970; revised July 22, 1971)

Abstract. The mechanism and feasibility of separation of talc from tremolite and dolomite by flotation was investigated. Experimental results showed that H₂SO₄ possesses good selective properties in soap flotation that qualify it as selective depressant for tremolite and dolomite. It seems that H₂SO₄ forms with calcium sites an insoluble hydrophilic compound of type CaSO₄.2H₂O⁻.

Talc being nonpolar mineral possessing high natural floatability could adsorb the nonionized oleic acid molecules the pK_a of which is 5.5 and be floated off. Results of amine flotation showed that talc could be separated from dolomite but not from tremolite. H_2SO_4 was without beneficial effect in amine flotation due to the adsorption of dodecylaminium ions on silicon sites in the case of tremolite and the positive surface charge of dolomite.

FUSION OF PHOSPHATE ROCK WITH SEA SALTS AND SODIUM CARBONATE

A. ANSARI

Department of Chemistry, University of Karachi, Karachi 32

(Received May 12, 1971; revised August 31, 1971)

Abstract. Phosphate fertilizer has been produced by fusing sea salt with phosphate rock at 900° C. A product of 100% available $P_{2}O_{5}$ is obtained which is higher than the reported values. The X-ray pattern and the reaction mechanism are also given. The feasibility of the process for commercial exploitation has been discussed.

VARIABLES AFFECTING THE POUR-POINT DEPRESSING PROPERTY OF THE ALKYLATED PRODUCT OF INDIGENOUS MICROCRYSTALLINE WAX AND NAPHTHALENE

SHABBIR AHMED QURESHI and ABDUL HAMEED SHAIKH

PCSIR Laboratories, Karachi 39

(Received June 9, 1971)

Abstract. Mineral oils such as furnace, lubricating and jute-batching oils, tend to freeze in winter season which makes their pumping difficult. In order to facilitate pumping, their

pour-point is lowered by adding a pour-point depressant in small amounts.

A number of pour-point depressants partly based on indigenous raw materials such as paraffin-waxes, chlorine and certain aromatic compounds have been prepared in these laboratories. One of the condensation products obtained from microcrystalline-wax (molecular formula $C_{40}H_{82}$) and naphthalene, is capable of depressing the pour-point of the jute-batching oil (JBO) from 65°F to less than 20°F.

The variables which effect the degree of condensation and make the end product useful as pour-point depressant are temperature, time of reaction, amount of chlorine in the chlorinated-wax and the proportion of reactants and catalyst. The study of these variables forms the basis of the present investigation.

EFFECT OF GAMMA RAYS IRRADIATION ON COTTON FIBRE AND YARN

DOST M. SANDILA and MUHAMMAD SHAMIM

Pakistan Institute of Cotton Research and Technology, Karachi

(Received November 3, 1971; revised December 9, 1971)

Abstracts. The effect of gamma rays irradiation was studied on the raw cotton and cotton yarn. The results have shown that the strength decreases when the cotton fibre or cotton yarn is exposed to gamma rays. The rate of decrease increases with the increase in the dose of gamma irradiation. The colour of cotton fibres and yarn changes to brownish while the crystallite orientation angle of cotton fibres increases with the increase in irradiation dose. All the above changes in characteristics are attributed to chemical modification in the structure of cellulose.

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X-RAY STUDIES ON TWO BAUXITIC ORES FROM KATTHA, PUNJAB

F. A. FARUQI

PCSIR Laboratories, Lahore 16

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AN ENGINEERING AND CONTRACTING COM-PANY AND ITS PROSPECTS IN A DEVELOP-ING NATION

MUHAMMAD AKBAR

Production Division, Saigol Brothers Ltd., Punjab

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