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**POSSIBLE EXISTENCE OF DISCONTINUITIES IN THE FIRST AND HIGHER
DERIVATIVES OF THE COEFFICIENT OF DILATATION OF PURE WATER**

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In an effort to elucidate the nature and physical basis of the discontinuities observed in the activation energy E_T for viscous flow of water (Qurashi and Ahsanullah, 1961) and dilute aqueous alcohol, a full differential analysis has been made of the accurate standard data on density of water from 0°C. to 40°C. The derivatives are first evaluated at 2°C. intervals, and the plot of the coefficient of dilatation, $\alpha = -(\Delta\rho/\Delta T)/\rho$, appears smooth but is not fitted by any simple function. The plot of $\Delta\alpha/\Delta T$ shows four inflections at 10°, 21°, 29° and 33°C., all of which temperatures agree within 1.5°C. with those of corresponding jumps found in the plot of E_T/R from viscosity measurements.

Recalculation of α and $\Delta\alpha/\Delta T$ with $\Delta T=1^\circ\text{C.}$ from 1°C. to 19°C. brings up two more steep drops in $\Delta\alpha/\Delta T$ at 5°C. and 8°C., (and probably one at 16°C.), while calculation of $\Delta^2\alpha/\Delta T^2$ with $\Delta T=2^\circ\text{C.}$ indicates the likely presence of three smaller ones at 16°C., 18°C. and 37°C. The temperatures of all the nine jumps in $\Delta\alpha/\Delta T$ agree well with those of the nine jumps previously observed in E_T/R in the range of 1°C. to 40°C. thus suggesting that the two phenomena have a common physical basis of inter-molecular aggregation or re-arrangement and are third order changes.

CHLORINATION OF CHROMITE WITH CARBON TETRACHLORIDE VAPOUR

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A method has been worked out for the chlorination of chromite with CCl_4 vapour, which can be used either for selective action on the iron constituent or for the complete chlorination of both iron and chromium.

Chlorination is inappreciable at 650°C . At 700°C ., the chlorination of iron is more pronounced, and best results are obtained in two hours when 80% of iron is chlorinated but only a third of the Cr_2O_3 is affected, the Cr/Fe ratio of the residue increasing to 10.64 (from 2.9 of the original ore).

Formation of CrCl_3 becomes pronounced from 750°C . Virtually complete chlorination of Cr_2O_3 (and, of course, FeO) can be achieved in three hours at 850°C . Silica remains unaffected.

Influence of several incorporates have been studied and the probable mechanism of the reaction discussed.

CHEMICAL COMPOSITION OF CHROMITES FROM PESHAWAR REGION

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Chemical analyses and study of the composition of chromites from Peshawar region are presented for the first time. Complete analyses of ten samples and partial analyses of seven samples have been given. The Qilla deposits are of metallurgical grade with Cr/Fe ratio exceeding 3:1. The samples from Landi Raud, Ospan Khare and Behram Dehri have low chromium content and may be exploited for chemical and refractory purposes. The chemical composition of these chromites is discussed on the basis of unit cell structure. All of these, excepting the two, are found in the fields of aluminian chromites.

**SOLVENT EXTRACTION OF ANTIMONY (III) FROM CHLORIDE SOLUTIONS WITH
TRI-*n*-BUTYL PHOSPHATE (T.B.P.)**

Part I.—Extraction from Acid Solutions

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Extraction of antimony (III) from chloride solutions with pure and also diluted TBP has been examined. At tracer concentrations, Sb(III) is extracted as a hydrated species, $\text{SbCl}_3 \cdot 2\text{TBP} \cdot (\text{H}_2\text{O})_x$. At *macro* concentrations, extraction takes place possibly through the formation of one or more hydrated and/or polynuclear TBP solvates. In the extracted species, SbCl_3 never associates itself with any HCl, which is contrary to the normal behaviour of trivalent metal chlorides.

POSSIBLE APPLICATIONS OF CLIFTON SAND IN BUILDING INDUSTRY

Part I.—In Thermal Insulating Materials

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This paper describes the possible uses of the Clifton sand as a thermal insulating material in building industry. The cellular concrete having a density of 30 lbs. per cubic foot made by incorporation of 25% of this sand with Portland Cement has a thermal conductivity of a cork. When bonded with ordinary clay, it can be advantageously used for the manufacture of insulating bricks suitable for use in buildings and secondary lining of high temperature furnaces. Bricks made by binding the sand with sodium silicate give very high strengths and can meet the requirements for heavy floors. As such it can be used as a filling material for ground floors under plinth and in cavity wall constructions.

A PRELIMINARY EXAMINATION OF THE TEMPERATURE VARIATION OF REFRACTIVE INDEX OF WATER AND ITS FIRST DERIVATIVE

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In previous work, the activation energy E_η of viscous flow and the first derivative of the coefficient of dilatation, $\delta\alpha/\delta T$ have been found to exhibit sharp jumps at corresponding temperatures. In an effort to establish these phenomena on a firmer footing, the first derivative of the refractive index $\delta n/\delta T$ has been measured for pure water at 1°C . intervals from 15°C . upto 50°C .

The values obtained at 20°C . with both the red and blue cadmium lines agree with that quoted in the literature, but the complete graph of $\delta n/\delta T$ against temperature shows a series of well-defined cyclic variations with a mean period of about 4°C . and an amplitude of 20-50% of the mean value. This feature is confirmed by more accurate measurements made with the strong green line, and by comparison with the graph of α for water. A comparison of the temperatures at the maxima and minima is made with those for the jumps in E_η and $\delta\alpha/\delta T$, and it appears that there is general agreement within about 1°C . Further work on aqueous solutions and pure liquids is in progress.

**THE THERMODYNAMICS OF SULPHURIC ACID IN ALCOHOLS FROM
ELECTROMOTIVE FORCE MEASUREMENTS**

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Electromotive force measurements have been made on the cell

Pt, H₂ (1 atm.)/H₂SO₄ (m), S/Hg₂ SO₄. Hg

where 'S' stands for organic solvents like methanol and *n*-propanol. The molality of the acid was varied from 0.022 to 4.00M. Standard potentials have been evaluated by the application of Debye-Hueckel limiting equation with a linear term. Mean ionic activity coefficients were calculated on the assumption that the acid acts as a uni-bivalent electrolyte. The values of the standard potentials were found to be 0.3754 and 0.2687 at 32°C. for methanol and *n*-propanol, respectively. The values of mean ionic activity coefficients were found to be much lower than those in aqueous solutions at the corresponding molalities.

STUDIES IN THE ELECTRICAL INSULATION PROPERTIES OF NATURAL AND SYNTHETIC MATERIALS

Part II.—Analysis of the High and Low Voltage Measurements on humidified Wood and “Jutoid”

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The previously reported data on the variation of electrical conductance with applied voltage and absorbed water in some materials are analyzed more fully and the following approximate relationship is proposed for samples of jutoid, a jute-based bituminous composition,

$\log \gamma/\gamma^0 = 0.045 (CF + 0.02 F^2) + 0.5 \times C$, where C is the weight % of water and F is the applied field in kilovolts/cm.

STUDIES IN THE FIXED OIL FROM THUJA ORIENTALIS SEEDS

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Oil from the seeds of *Thuja orientalis* has been examined by chemical and physical means, including gas chromatography. The saturated acids have been identified as palmitic and stearic acids. The unsaturated acids have been hydrogenated and shown to be of the C₁₈ and C₂₀ series. The unsaturated acids have also been identified by the preparation of their bromo-derivatives.

The unsaponifiable matter has been found to consist of β -sitosterol, yellow liquid and an amorphous substance, the last two being unidentified.

STUDIES IN WAXES

Part I.—Khavi Grass (*Cymbopogon iwarncusa*) Wax

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Khavi grass (*Cymbopogon iwarncusa*) wax has been examined by chemical and physical methods including gas chromatography. The wax, after saponification, has been shown to consist of 48.5% of unsaponifiable matter and 25.93% of simple and hydroxy acids. The unsaponifiable fraction was found to be composed of 86.6% of hydrocarbons, 13.02% of alcohols and traces of ketonic bodies.

A feature of the wax is the presence of very large amounts of hydrocarbons separable into two distinct fractions by column chromatography, having melting ranges (25—28°) and (66—67°) respectively. In the acid fraction, behenic acid has been shown to be the major constituent (more than 80%) while other acids which could not be identified have also been traced in small quantities. In alcohol fraction, 81.8% of tetradecanol was detected while two other alcohols, however, could not be identified.

**STUDIES ON THE INFLUENCE OF INTEGRAL WATERPROOFING POWDERS ON THE
PHYSICAL PROPERTIES OF CEMENT AND CONCRETE**

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The influence of integral water proofing powders, particularly 'Cemto' and an imported product, on the physical properties of cement and concrete has been studied. These compounds do not have any appreciable influence on the setting properties of Portland cement which might cause any construction problem. They reduce the compressive strength of concrete but are effective water-repelling materials. Recommendations regarding the amount of 'Cemto', a composition developed by the P.C.S.I.R. for different applications are tabulated.

THE EFFECT OF ACID DYES ON PAKISTANI WOOL FIBRES

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In order to obtain dyed material of level dyeing and better shades on Pakistani wool fibres, the effect of acid dyes, especially that of levelling and milling acid dyes was studied. To achieve better exhaustion of the dyebath at the shortest possible time at low temperatures and at the same time to obtain uniformity of dyed material, experiments have been carried out by adding certain dye assistants to the dyebath. The diameter of wool fibres have been determined with the various depths of shade, and to avoid the breakdown of peptide linkages, which results in the loss of strength of wool fibres, suitable pH values have been found out from the experimental work. It was found that 90% exhaustion of the dyebath occurs in 30 minutes by the addition of 3% amyl alcohol. The maximum dye uptake of true wool fibres was found to be 32.4%. The loss in strength of fibres were considerably reduced by controlling pH at 2—4 in levelling dyes and 4—6 in the case of milling (I.C.I.) acid dyes. The tensile strength of undyed wool fibres was found out to be 2010 kg./2cm.², while that of dyed wool fibres, 2016 kg./cm.².

STUDY ON THE REGIAN OF PAKISTANI WOOL FIBRES

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(Received January 16, 1963)

The variation between time in minutes and loss in weight, time in minutes and percentage regain and the effect of the varying humidity on percentage regain of adsorption and desorption of unscoured Kaghani and Harnai wool fibres has been studied. It was found that Kaghani wool fibres take about 80 minutes to reach the dryness, while Harnai wool fibres take only about 60 minutes. The rate of both desorption and adsorption in Kaghani wool fibres is greater than in the Harnai variety while the rate of desorption in the Kaghani variety as well as the Harnai variety is greater than absorpion.

**CITRIC ACID PRODUCING MICROORGANISMS—THEIR IDENTIFICATION AND
CITRIC ACID PRODUCING CAPACITY**

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(Received November 16, 1962)

Morphological, cultural and biochemical studies on thirteen strains of citric acid producing microorganisms have been described. All the organisms are the different strains of the species *Aspergillus niger*¹. Though there is no appreciable difference in their morphological and biochemical characters, yet there are wide differences in their cultural activities towards different media and in the production of citric acid from molasses. Different media were used to determine the optimum conditions for the production of citric acid by employing the surface culture method.

EFFECTS OF CHAKSINE CHLORIDE ON CHOLINERGIC AND TRYPTAMINE RECEPTORS IN THE ISOLATED GUINEA—PIG ILEUM

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The stimulant and inhibitory actions of chaksine have been investigated on the isolated ileum of the guinea pig. The dose ratios to the various stimulant drugs (nicotine, 5-hydroxytryptamine, acetylcholine and histamine) were determined by keeping various concentrations of the antagonists in the bath for one hour and plotting the dose-response curves to the stimulant drugs before and after.

Chaksine chloride produced a weak antiacetylcholine effect. Chaksine showed a marked antinicotinic effect which increased with increase in the concentration of chaksine. It is a ganglion-blocking agent and also blocks nicotine receptors on the muscle cell. It is a potent anti 5-hydroxytryptamine agent and its increasing activity with the increase in the concentration indicates its dual action both at the muscle (D) receptors as well as at the nervous (M) receptors.

Isochaksine in a few experiments showed a much weaker atropine—like activity, antinicotinic, and anti-5-hydroxytryptamine activity. Further study with chaksine on the changes in behaviour of animals and human beings are suggested.

PROTEIN VALUES OF PAKISTANI DIETS AND MEALS*

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Protein values of the East and West Pakistan diets and meals were determined according to the method of Miller and Bender. The Net-dietary Protein Calories % (NDP Cals%) of the East Pakistan diet is 5.3 and of the rice based meals lie between 6.3-6.6. Such a diet or meal is unsuitable for the nourishment of vulnerable groups of population i.e. growing children, pregnant and nursing mothers. The protein values of the West Pakistan diets and dishes generally range from 6.8 to 7.7 which make them slightly superior to the East Pakistan diet although these do not fulfill the protein requirements of the vulnerable groups.

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PROTEIN VALUES OF PAKISTANI DIETS AT DIFFERENT LEVELS OF CALORIC INTAKE*

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EFFECT OF VARIOUS SUPPLEMENTS OF THE PROTEIN VALUE OF PAKISTANI DIETS*

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**A NOTE ON THE RELATIVE NUTRITIVE VALUE AND THE TOTAL AND “AVAILABLE”
METHIONINE TRYPTOPHANE AND HISTIDINE IN SOME FISH FLOURS**

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