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**TEMPERATURE DEPENDENCE OF THE INTERMOLECULAR ACTIVATION  
ENERGY FOR FLOW IN LIQUIDS AND SOLUTIONS**

**Part I.—Investigation of the Influence of Alcohol Concentration on the Activation Energy  
Jumps in Dilute (0 to 11%) Aqueous Ethyl Alcohol**

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Following the discovery of discontinuities in the activation energy of flow in several hydroxylic liquids, the investigations are here extended to the simple binary series of ethyl alcohol and water. The experiments have been carried out using a very small measuring interval  $\Delta T = 1$  deg. C. in the equation

$$\epsilon/k = \Delta \ln \eta / \Delta(1/T) = -T^2 \Delta \ln \eta / \Delta T$$

and preliminary results in the range of 10° C. to 50° C. on 5% and 11% aqueous alcohol and on pure water for comparison are reported here. The measured values of  $(\epsilon/k)/1000$  are reproducible to  $\pm 0.012$ , i.e. to about 0.5% for aqueous alcohol and to about half this figure in the case of pure water.

Graphical comparison provides indications for a systematic shift of corresponding energy jumps towards higher temperatures, amounting to 3–5° C. for 10% alcohol concentration, accompanied by an average increase of about 16% in the activation energy. The depths of two of the jumps in the case of 11% alcohol are such (nearly 6% of the total  $\epsilon/k$ ) that they are readily discernible in the earlier standard data on 10% alcohol as well. Further work on higher alcohol concentrations is in progress.

**TEMPERATURE DEPENDENCE OF INTERMOLECULAR ACTIVATION  
ENERGY FOR FLOW IN LIQUIDS AND SOLUTIONS**

**Part II.—Preliminary Application of the Ideas of Domain Structure to the Energy  
Jumps Observed in Ethylene Glycol**

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A preliminary account is given of the possible application of theories of first and second order transitions to discontinuities in activation energy of flow observed in several di-hydroxylic liquids. It is shown that the specific heat data for ethylene glycol ( $\text{CH}_2\text{OH})_2$  are consistent with the idea that the extra change in internal energy due to molecular association or ordering over the range  $28^\circ$  to  $68^\circ\text{C}$ . is about one half of the change in flow activation energy over the same range.

Assuming that the molecular ordering corresponding to each jump in activation energy is similar in effect to the well known order  $\rightleftharpoons$  disorder transitions for magnetism and for alloys like  $\beta$ -brass, an estimate can be made of the height of the anomalous specific heat peaks to be expected. This comes out to be of the order of  $0.01 \text{ cal./g./}^\circ\text{C}$ . for ethylene glycol, which would not be readily observed by conventional calorimetry, but is well within the power of microcalorimetric methods.

**CATION EXCHANGE PROPERTIES OF SULPHONATED LIGNIN-FURFURAL RESIN**

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Lignin has been condensed with furfural in the presence of acid catalyst to prepare an insoluble and infusible (highly cross-linked) resin. This on sulphonation gave a new cation-exchanger. Sulphonation has been carried out under varying conditions and best results were obtained with  $MnO_2$  as a catalyst. Capacity values were determined with a number of standard methods and they compared well. A capacity value of 1.72 m. equiv./g. (for  $-SO_3H$  group only) was obtained.

Characteristics of the resin were further studied and it is shown that, besides the  $-SO_3H$  group, it also contains  $-COOH$  and  $-OH$  (phenolic) groups.

**DETERPENATION OF PAKISTANI LEMON AND ORANGE OILS**

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Various processes for the deterpenation of Pakistani lemon and orange oils have been studied with regard to their efficiency. Silica gel and fuller's earth as adsorbents have been found most efficient. It has been shown that the deterpenation of the oils is quite feasible and about 4% of the more valuable oxygenated products can be recovered.

**BIOCHEMICAL AND NUTRITIONAL STUDIES ON EAST PAKISTAN FISH****Part VIII.—Acetylcholinesterase Activity in the Fresh and the Decomposed Fish Tissue and its Relationship with the Spoilage Characteristics**

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(Received November 27, 1961)

The acetylcholinesterase activity of fifteen species of small and bigger size fish was estimated and the value QACH $\Sigma$  ranged from 6.02 to 42.35 mg. per g. per hour. Some fish, specially the smaller size species showed an increase in the value on spoilage whereas the bigger species showed a decrease in the value. Bele (*Gobioides rubicandus*) fish maintained constant activity of nearly 12 mg. on storage. The logarithms of the percent increase and decrease in the activities plotted against the original values give a curve which shows that below 6 and above 17 mg. of activity (QACH $\Sigma$ ) in the fresh tissue there is no further change in the percent increase or decrease in the activities due to decomposition. At a normal level of nearly 12 mg. of QACH $\Sigma$  there is no further change in the activity due to storage. The significance of these results in the evaluation of their spoilage characteristic as related to the muscular activity and tissue survival has been discussed.

**DETERMINATION OF AMMONIACAL NITROGEN IN SOIL BY A KJELDAHL  
METHOD WITHOUT THE DISTILLATION PROCEDURE**

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The distillation step in the Kjeldahl determination of ammoniacal nitrogen in soil has been eliminated. Soil is digested in sulphuric acid with potassium and mercuric sulphates. The resulting ammonium sulphate is treated with an excess of hypochlorite in presence of sodium bicarbonate and potassium bromide. An excess of arsenite is then added and back-titrated with the hypochlorite using Bordeaux indicator. The method is comparable in accuracy to the A.O.A.C. method.

**MICRODETERMINATION OF CHLORINE IN CHLORO-ORGANIC COMPOUNDS**

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The procedure consists in decomposing the compounds in a nickel capsule with sodium metal enclosed in a sealed glass tube at 350°C. The chloride formed is converted into hydrochloric acid through cation-exchange resin. The acid is titrated with a standard alkali. The method is applicable to solids as well as to liquids and avoids the uncertainties and difficulties associated with argentometric titrations and gravimetric finishes.

**A RAPID CHROMATOGRAPHIC METHOD FOR THE ANALYSIS OF COAL ASH**

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(Received February 19, 1952)

The various macrochemical methods for determining the composition of coal ash are time consuming and laborious. **In this paper, a chromatographic method is discussed which is both rapid and simple.** A new solvent system has been developed which not only saves time but also gives better  $R_f$  values, and is found to be very useful for quantitative estimation of rare elements like titanium, even when they are present in traces. This method could be applied for the analysis of other minerals also.

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**ROOF SLABS IN LOW COST HOUSES****Part I.—Plain Concrete Vault Roofs**

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The construction and testing of plain concrete slabs have been described. Two types of vault roofs with uniform and varying arch thickness were laid on rooms (10'-3" × 11'-7" inside dimensions) and tested under a uniformly varying superimposed load of sand bags. The low deflection under a high test load indicates the suitability of the design for single storey-houses.

**MANUFACTURE OF TABLE SALT FROM INDIGENOUS ROCK SALTS**

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(Received September 1, 1961; revised December 9, 1961)

Good quality table salts are almost all imported. The local brands do not conform to specifications in chemical and free-running properties. The authors have investigated the feasibility of preparing free-flowing table salts from indigenous rock salts by simple crystallization and coating the crystals with 1% of calcium or magnesium carbonate. The chemical compositions of the raw materials and the prepared table salt, along with those of local and foreign brands have been determined. The grain sizes of different varieties have also been compared.

## **THE OCCURRENCE OF SULPHUR IN COAL**

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The problem of the occurrence of sulphur in coal is of considerable importance in many countries and has attracted attention at one time or another without any very precise conclusions having been drawn. Sulphur is present in coal in both organically combined and inorganic forms—the latter as pyritic and sulphate sulphur—and its content varies over a wide range, from a fraction of 1% to over 10%, but there is insufficient knowledge of the forms in which it exists in organic combination. In Pakistan a difficulty arises in the utilization of indigenous coal because the major part of the reserves consists of coals containing an unusually large proportion of organically combined sulphur which cannot be removed from the coal by means of well-known methods alone.

This article is a brief review of our present knowledge about different forms of sulphur and their origin, with special reference to the organic sulphur compounds present in coals.

**SHORT COMMUNICATION**

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**MOLYBDENUM-CARBOHYDRATE COMPLEXES**

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(Received March 21, 1962)

# **MANGANESE-CARBOHYDRATE COMPLEXES**

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(Received March 21, 1962)

# **NICKEL-CARBOHYDRATE COMPLEXES**

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(Received August 21, 1962)

# **COBALT-CARBOHYDRATE COMPLEXES**

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(Received March 21, 1962)

# **PREPARATION OF CHAKSINE CHLORIDE FROM CHAKSINE SULPHATE USING ION-EXCHANGE RESIN**

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(Received March 30, 1962)



## **A REVISED METHOD OF PREPARING RENNET**

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**MEDICINAL PLANTS OF WEST PAKISTAN: ACACIA SENEGAL WILLD**

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(Received February 20, 1962)

# **FLORAL ABNORMALITIES IN CASSIA GLAUCA LAM**

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(Received November 25, 1961)

## **DETERMINATION OF ALKALOIDS BY RESIDUAL NON-AQUEOUS TITRATION**

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