

Physical Sciences Section

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A CRITIQUE ON SOME RECENT THEORIES OF CHEMICAL BONDING

Part I. Quantum Mechanical Models

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Abstract. Since the advent of quantum mechanics, many models to explain the nature of chemical bonding have been put forward. Some of these models are based directly on quantum mechanical foundation while others involve semi-empirical parameters or ad hoc assumptions. In the following articles (Parts I and II), various bonding theories developed relatively recently have been discussed. Part I describes the concepts of the Pauli exclusion principle and the linear transformations which are prerequisite to follow the ensuing arguments. These are treated in some details because of their importance in showing correlation between different models discussed in these articles.

The models treated here have been classified as (a) quantum mechanical and (b) non-quantum mechanical on the basis of the arguments as to their foundations. The models treated under heading (a), Part I, are the Hartree-SCF scheme, the Walsh diagrams, the Linnet double spin set model, and the FSGO model.

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A CRITIQUE ON SOME RECENT THEORIES OF CHEMICAL BONDING

Part II. Non-Quantum Mechanical Models

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Abstract: In part II are discussed the charge cloud model, the tangent sphere model, and the VSEPR model. These models, although essentially qualitative in nature, have been extremely helpful as interpretive tools. Basic assumptions in the charge cloud, the tangent sphere and the VSEPR models have been given. In comparing these models, attempt has been made to bring out clearly their similarities and differences. A short summary and conclusions (for Part I and II) are given at the end of of this paper.

INVESTIGATION OF THE OXIDATION KINETICS OF COPPER AND THE INTERNAL IRREGULAR STRUCTURE OF THE SEMICONDUCTING CUPROUS OXIDE PRODUCED

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Abstract. The oxidation kinetics of copper at two different temperatures (949, 1030°C) has been investigated. The role of the internal irregular structure resulting during sample preparation has been discussed and it is concluded that the growth mechanism is controlled by the diffusion of copper cations and vacancies from the interior towards the outside surface under the influence of a concentration gradient. This concentration gradient was found to vary in a complex manner and not to obey a simple relation. Alloying copper with small amounts of metals of higher valency disturbs the concentration gradient in a way permitting the acceleration of the oxidation process.

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GAS-PHASE OXIDATION OF ALIPHATIC KETONES

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(Received June 5, 1973)

Abstract. The gas-phase oxidation of aliphatic ketones shows most of the characteristics of hydrocarbon oxidation. The oxidation both in high and low temperature regions proceeds by a free-radical chain reaction. The intermediate responsible for branching is formaldehyde at high temperatures, while at low temperatures branching is brought about by alkyl hydroperoxides. Comparative studies with acetone, butanone and pentan-3-one of the maximum rate and the minimum pressure for cool-flame propagation and the order of reaction were carried out.

METAL COMPLEXES OF 2-GUANIDINOBENZIMIDAZOLE

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(Received January 30, 1973; revised April 11, 1973)

Abstract. GBM forms complexes not only with the first row transition metals, but it also coordinates with metals like Au(I), Pt(IV), Th(IV) and Cd(II). Some of these metals form only mono complexes whereas bis- and tris-complexes are formed with other metals. The physical measurements on these complexes indicate that in bis-complexes two GBM molecules coordinate with the central metal atom in the *xy*-plane and the anions occupy the apical *z*-positions, resulting in a distorted octahedral configuration around the metal atom.

SYNTHESES OF SOME INDOLIC IMINO-ETHERS AND THEIR CYCLIZATION STUDIES

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(Received May 15, 1973; revised July 2, 1973)

Abstract. Acetyltryptamine and benzoyltryptamine react with triethyloxonium tetrafluoroborate to afford the corresponding imino-ethers which do not undergo intramolecular cyclization to the corresponding β -carbolines. Tryptamine reacts with chlorobutyryl chloride to afford the imide (X). With excess tryptamine, the chloroimide (XI) is obtainable which cyclizes to the lactam (XII) with sodium hydride. The lactam (XII) afforded the enamino ether (XV) on treatment with triethyloxonium tetrafluoroborate which also failed to cyclize to the corresponding β -carboline. These results are rationalised in the light of the facile intramolecular cyclization of 3-(2-succinimido-ethyl) indole (I).

COMPARATIVE STUDIE OF THE EFFECTS OF ULTRASONICS, RED LIGHT AND GIBBERELIC ACID, ON THE GERMINATION OF CASSIA HOLOSERICEA FRES SEEDS

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(Received April 4, 1972; revised April 2, 1973)

Abstract. A comparative study of the increase in germination of *Cassia holosericea* Fres seeds by ultrasonics treatment against those of red light and gibberellic acid treatment have been made. An increase of approximately six times germination over the control are obtained with the seeds treated with ultrasonics of 1 MHz, 30 watts /cm² for 20 min at the incubation temperature of 40°C; whilst three- and four-folds increase are recorded with the seeds exposed to red light for 24 hr and treated with 20 p.p.m. gibberellic acid respectively at about 35°C incubation temperature.

Short Communication

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IODIMETRIC AND IODOMETRIC DETERMINATION OF HYDRAZINE MODIFIED PROCEDURES

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Biological Sciences Section

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THE BIOCHEMORPHOLOGY OF CYCLOBUTANECARBOXIMIDES

Part II*

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(Received April 25, 1973)

Abstract. Several *N*-acylcyclobutanecarboxamides have been synthesized and examined for general central nervous system depressant properties, barbiturate potentiation, myorelaxant, antitremorine and anticonvulsant potency. Water solubility appears to play a major role in the activity of these compounds. *N*-4-Hydroxybutyrylcyclobutanecarboxamide, the most potent myorelaxant of the series, appears to be more potent than most of the clinically used strychnine antagonists. *N*-Methacrylyl, *N*-phenylacetyl, *N*-3,5-dimethoxybenzoyl, *N*-furoyl and *N*-3,4,5-trimethoxybenzoylcyclobutanecarboxamides are moderately active tremorine antagonists. None of the compounds is active against pentylenetetrazole induced convulsions.

**RHABDOCHONA CAVASIUS sp. n. (NEMATODA: RHABDOCHONIDAE) FROM A FISH
MYSTUS CAVASIUS (HAM) FROM KALRI LAKE, SIND**

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(Received September 14, 1972; revised May 2, 1973)

Abstract. A new species of the genus *Rhabdochona* Railliet, 1916, is described from a fish *Mystus cavasius* (Ham) of Kalri Lake, Sind, West Pakistan. The new species is characterised by possessing a pair of glandular structures on either side of the buccal cavity, well-developed cervical alae; relatively small body; spicules 0.12 mm and 0.042 mm long respectively; 14 pairs of caudal papillae; 9 pairs preanal and 5 pairs postanal.

STUDIES ON BILE**Part I. Quick Method of Cholic Acid Estimation in Bile/Bile Concentrate**

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(Received April 27, 1973)

Abstract. For the determination of cholic acid Reinhold and Wilson's modification of the modified Gregory-Pascoe reaction was investigated. When applied on bile or bile concentrate the results obtained were definitely on the lower side in the presence of proteins and pigments. The presence of deoxycholic acid and cholesterol in bile seems to have no effect.

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EFFECT OF IRON ENRICHMENT OF FLOUR ON THE DOUGH CHARACTERISTICS AND ORGANOLEPTIC QUALITIES OF ARABIC BREAD*

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(Received October 30, 1972; revised April 2, 1973)

Abstract. Effect of iron enrichment of flour on the dough characteristics and baking qualities has been studied. Salts used for iron enrichment were: reduced iron, ferric ammonium citrate, ferrous sulphate, ferric chloride and ferrous gluconate. It was found that up to enrichment level of 50 mg Fe/lb flour, there was no adverse effect on the physical characteristics of the dough as measured by Brabender farinograph and on the colour, texture, taste, off-flavour and general acceptability of the baked bread, irrespective of the salt used. Higher levels of enrichment in case of ferric chloride, ferrous sulphate and ferrous gluconate affect the dough and bread qualities adversely. Reduced iron and ferric ammonium citrate have minimum effects and hence seem to be good choices for flour enrichment.

DETERMINATION OF OPTIMUM CONDITIONS FOR THE PROPAGATION OF BAKER'S YEAST ON MOLASSES

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(Received August 7, 1972; revised April 4, 1973)

Abstract. A yeast strain, *Saccharomyces cerevisiae* IMI-39916 was grown in a medium based on cane molasses to determine the optimum conditions for its growth. Maximum yield of yeast on the basis of total sugars was obtained when the mash contained 1.0% total sugars, 20 and 30 mg/g of sugar of added phosphorus and nitrogen respectively. Variations in pH of the mash between 4.0 and 5.0 did not affect the yield significantly. The highest yield of yeast up to 46.10% of total sugars was obtained during these studies. The sample of molasses used, contained 17.82% reducing sugars, 49.26% nonreducing sugars, 15.03% ash, 0.75% total nitrogen and 1876 p.p.m. phosphorus on dry weight basis.

EFFECT OF NITROGEN AND PHOSPHORUS ON PROTEIN AND OIL CONTENT OF TWO SUNFLOWER VARIETIES

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(Received November 29, 1972)

Abstract. A field experiment was conducted in order to study the effect of nitrogen and phosphorus fertilizers on the protein* and oil contents of two sunflower (*Helianthus annuus*) varieties HO-I and Peredovic. Nitrogen applied as ammonium sulphate at the rates of 0, 34 and 68 kg/ha and phosphorus (P_2O_5) as superphosphate at the rates of 0, 28 and 56 kg/ha in a factorial set of combinations. Increased average protein percentage was obtained by increasing the rates of nitrogen. Phosphorus alone increased the average oil percentage. Nitrogen and phosphorus in combination at the rates of 68 kg/ha and 28 kg/ha respectively produced the highest mean protein percentage while 34 kg/ha of nitrogen and 28 kg/ha of phosphorus gave the highest mean oil percentage. Peredovic variety produced significantly higher oil percentage.

Interaction effects of nitrogen and phosphorus and nitrogen, phosphorus and varieties were nonsignificant in case of protein and oil percentage.

Short Communications

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THE CHARACTERISTICS OF HIBISCUS ESCULENTUS OKRA (BINDI) FIBRES

**ARBAB ABDUL WAKIL, NISAR JAMIL and
MIAN TAJ YOUNIS**

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**ON THE OCCURRENCE OF SOME PLANT-
PARASITIC NEMATODES WITH SPECIAL
REFERENCE TO NEW HOSTS IN
WEST PAKISTAN**

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During the course of population studies several

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A REFINED TECHNIQUE OF HORMONE APPLICATION TO PLANTS

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**AMINO ACID COMPOSITION AND NUTRI-
TIVE VALUE OF ARHAR (CAJANUS
INDICUS) GROWN IN PESHAWAR REGION**

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Technology Section

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EFFECT OF GAMMA RADIATION AND STORAGE ON THE BIOCHEMICAL AND TECHNOLOGICAL PROPERTIES OF SOME PAKISTANI WHEAT VARIETIES

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(Received February 1, 1973)

Abstract. This investigation was carried out to study the effect of gamma radiation (10-1000 krad) and storage (one year) on C-591 and Mexi-Pak wheat varieties. Biochemical parameters investigated were moisture, ash, fat, sugars, protein, gluten (fresh and dry), amino acids, fat acidity and protein solubility. Bread making and 'roti making' properties of irradiated and unirradiated wheat were also studied. It is concluded from this investigation that gamma radiation doses up to 100 krad have no adverse effect on both varieties of wheat and the irradiated wheat remains wholesome from biochemical, technological and organoleptic points of view during storage period of one year.

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ELECTROLYTIC COLOURING OF IRON

Part I

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(Received August 18, 1972; revised March 8, 1973)

Abstract. An attempt has been made to develop a suitable method for electrolytic colouring of iron from different electrolytic media, using different cathode materials and various addition agents to the NaOH-NaNO_3 baths. The effect of addition agents, viz. sodium nitrite, potassium permanganate, and ammonium molybdate on the electrolytic colouring has been studied. The surface texture before and after the colouring was observed under the magnifying lens ($\times 10$). The limits of the optimum operating variables studied for different compositions are given and their results shown.

MIXING OF FREE FLOWING GRANULAR MATERIALS IN HORIZONTAL-MIXERS

Part I. Effect of the Inclined Flights on Mixing Time

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(Received June 3, 1972; revised March 8, 1973)

Abstract. Experiments on mixing of $-16+18$ B.S.S. mesh sand, (coloured and uncoloured) in a horizontal rotating drum with and without inclined flights both for superimposed and adjacent-layers have been carried out. The effect of load-fraction on the mixing time also has been studied.

The results show that in *absence* of flights for superimposed layers, the mixing time is shorter as compared to adjacent parallel layers while their presence introduces axial-movement and reduces mixing time in both the cases in proportion with the slope of the flights. It has been further observed that with the increase in the load-fraction p , the mixing time t also increases. A general correlation between σ^2 and ' t ', of the type $\sigma^2 = \frac{t}{a+bt} + c$, has been proposed.

THE RELATIONSHIP BETWEEN THE DENSITY AND MORTALITY OF FLOUR BEETLES EXPOSED TO PETKOLIN-TREATED SURFACES

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(Received November 21, 1972; revised July 2, 1973)

Abstract. When three or more beetles per cm^2 were exposed to Petkolin-treated filter papers in closed petri dishes the resulting mortality was much higher than when one beetle or less per cm^2 was exposed. Similar results were obtained with Petkolin dust. However, when the exposures were made in uncovered dishes the density-mortality relationship did not indicate the above trend. In case of Dimecron, though the exposures were made in covered dishes, the mortality did not increase with higher densities.

The probability of critical level of oxygen need in covered dishes has been reported by many workers in such studies. The same was the case with Petkolin in the present study.

**THE INCORPORATION OF THE LOW-VOLUME SPRAYING PRINCIPLE WITH THE USE OF
EXOGENOUS PROMOTERS FOR INCREASING THE EFFECTIVITY OF SYSTEMIC
PESTICIDES WITH REFERENCE TO THE COTTON PLANT**

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(Received February 15, 1973)

Abstract. The present work is a continuation of earlier studies on increasing the effectivity of systemic pesticides with an emphasis on economization and with reference to the cotton plant. It has been found that under local conditions the use of physiological promoters may be successfully incorporated with the low-volume spraying, where increase in the pest control capacities of the pesticide is desired.

MANUFACTURE OF BARIUM CHEMICALS FROM INDIGENOUS BARITE

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(Received July 31, 1972; revised March 19, 1973)

Abstract. A successful attempt has been made to manufacture barium carbonate from indigenous barite by a process involving reaction between barite and an aqueous solution of soda ash under atmospheric pressure. The effects of such variables as particle size, temperature, time and concentrations of the reactants on the reaction yield were studied. Highest conversion obtained was 95.80%.

Short Communication

EFFICACY OF PETKOLIN AND PHOSALONE MIXTURE AGAINST COTTON PEST COMPLEX IN MULTAN

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