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HETEROGENEOUS CATALYSIS FOR THE ESTERIFICATION OF CHLOROACETIC ACIDS WITH N-BUTANOL AND ISOBUTANOL USING DOWEX HCR-S

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(Received December 16, 1984; revised November 21, 1985)

The formation of *n*-butyl-and *iso*lutylmono-, di-, and trichloroacetate (esters) using DowexHCR-S (8% crosslinking) sulphonated polystyrene copolyer as catalyst. It was found that the rate of esterification was accelarated when the exchanger was used in combination with silica gel as dehydrator in amounts equal to 7.2%, 7% and 9.5% for monochloro-, dichloro- and trichloroacetic acids in the case of *n*-butanol and 8%, 8.5% and 10.3% in case of *iso*butanol respectively. The rate of reaction is found to increase significantly with the quantity of catalyst, molar ratio of reactants and reaction temperature.

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STUDIES ON THE BEHAVIOUR OF DISPERSE DYES INCORPORATING N-SUBSTITUTED CARBAMATE GROUP UNDER HEAT TRANSFER-PRINTING CONDITIONS

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(Received June 27, 1983)

Mass spectra studies of dyes incorporating N-substituted carbamate group have shown that these dyes generate free isocyanate group under transfer-printing conditions. This has been confirmed further by the presence of substituted ureas as unfixed species in the transfer-prints obtained from these dyes as indicated by the mass spectra of the unfixed dyes extracted from the prints.

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SPECTROSCOPIC STUDIES OF ORGANOPHOSPHORUS COMPOUNDS

Part XI. Preparation and IR Spectra of Phosphobetaine Tetrachlorocobaltates

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(Received July 15, 1985;revised January 10, 1986)

Tetrachlorocobaltates of phosphobetaine from triarylphosphines and *p*-quinones have been prepared in order to study the result of interaction of a bulky anion. Phosphobetaine tetrachlorocobaltates have been prepared either by the interaction of cobaltous chloride with phosphobetaine or phosphobetaine hydrochloride.

A comparison of the known spectra of phosphonium iodide, bromide and their tetrachlorocobaltates with those of phosphobetaine hydrochloride and their tetrachlorocobaltates indicates that the intensity of the IR bands as well as their positions are affected on changing the halides into tetrachlorocobaltates. There is a significant (four to five fold) enhancement in intensity and some of the bands like the k and l modes, which are otherwise unresolved, are well separated. The O mode behaves as an X-sensitive mode and is shifted to a higher frequency.

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OXIDATION OF ALKYLPYRIDINES BY METAL NAPHTHENATES PART-I

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(Received December 22, 1984; revised October 27, 1985)

Cobalt and manganese naphthenates were studiesd as catalysts for the oxidation of alkylpyridines. They were found to be inactive at room temperature. The catalytic activity of these naphthenates was observed at high temperature and conversion of alkylpyridines to the corresponding carboxylic acids was observed in moderate yield (24-28%).

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ENHANCEMENT OF TRACE METAL ATOMIC ABSORPTION SIGNALS THROUGH THE OPTIMIZATION OF PHYSICAL FACTORS ATTENDANT ON ASPIRATION RATES

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(Received March 24, 1985; revised December 23, 1985)

An optimization scheme based on instrumental components controlling the aspiration rates of water sample solutions in the flame atomic absorption technique is proposed. The methodology adopted stems from the quantitative study of the effect of such factors as fuel/oxidant flow rates, burner-slit, length, radii of aspiration and sampling capillaries, aspiration temperature and addition of organic solvent to the aqueous samples. The method is applied to the estimation of silver, copper, chromium, iron, strontium, zinc, cadmium, lead and mercury concentrations in drinking waters without the use of a preconcentration step. An overall hundred-fold enhancement in the absorption signals is achieved at a fairly high S/N ratio. The method is quantitative with a precision of ± 1% at the detection level of the individual trace metals.

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RECOVERY OF SILVER METAL USED IN CHEMICAL REACTIONS

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(Received July 24, 1985; revised January 13, 1986)

Two simple processes for silver recovery from the laboratory wastes are reported. One process depends on the dissolution of the wastes in sodium thiosulphate, detaching its sulphide sulphur by adding citric acid and coagulating the dispersed lyophobic sols of silver sulphide by lithium (carbonate). The other process depends essentially on the instantaneous reduction of manganate to a manganous ion in a strongly alkaline solution. This reaction is catalysed by $[Ag(NH_3)_2]^+$. The $K_2[Mn(OH)_4]$ formed is rapidly oxidised to the brown MnOOH which is further oxidised to the black MnO_2. H_2O with separation of metallic silver particles.

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ANTIMICROBIAL ACTIVITY OF THE ESSENTIAL OILS OF THE UMBELLIFERAE FAMILY

Part 1. *Cuminum cyminum*, *Coriandrum sativum*, *Foeniculum vulgare* and *Bunium persicum* Oils

Meena Syed, M. Hanif, F.M. Chaudhary and M.K. Bhatty

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(Received February 20, 1986)

The essential oils of *Cuminum cyminum*, *Coriandrum sativum*, *Foeniculum vulgare*, and *Bunium persicum* have been tested against the standard strains of *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhi*, *Shigella dysentery*, and *Vibrio cholera*. Optical density, measured spectrophotometrically at 530 nm, was taken as an index of the growth of bacteria in the liquid medium. While *Cuminum cyminum* has shown remarkable activity against all the pathogens at quite low concentrations, the other oils also exhibit such an activity but with larger amounts.

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ANTIMICROBIAL ACTIVITY OF THE ESSENTIAL OILS OF UMBELLIFERAE

Part II. *Trachyspermum ammi*, *Daucus carota*, *Anethum graveolens*, and *Apium graveolens* Oils.

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(Received March 24, 1986)

The essential oils of *Trachyspermum ammi*, *Daucus carota*, *Anethum graveolens* and *Apium graveolens* have been tested against the standard strains of *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhi*, *Shigella dysentery*, and *Vibrio cholera*. Optical density measured spectrophotometrically at 530 nm was taken as an index of the growth of bacteria in the liquid medium. The oil of *Trachyspermum ammi* exhibits remarkable inhibitory activity against all five pathogens while the other three oils also how comparable antibacterial activity.

were used

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THE FATTY ACIDS OF INDIGENOUS RESOURCES FOR POSSIBLE INDUSTRIAL APPLICATIONS

Part IX. Chemical Investigations of *Prunus armeniaca* (Apricot) Fruit Stones – Kernel Oils

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(Received July 6, 1985)

The chemical composition of two samples of fatty oil as well as essential oil of apricot (*Prunus armeniaca*) fruit stone kernels has been determined. The fruit stones were obtained from the northern and southern areas of Pakistan, Peshawar and Quetta. The oil from the kernels of the respective samples obtained in 45.9 and 45.7 % yield, is composed of myristic (1.2, 5.39 %), palmitic (3.5, 3.04 %), palmitoleic (9.48, 11.07 %), stearic (0.84, 1.95 %), oleic (70.93, 64.68 %), linoleic acid (12.05, 11.83 %) and unsapoifiable matter (1.88, 2.02 %).

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CITRUS OILS

Part I. Composition of the Monoterpenes of the Peel Oils of Oranges, Kinnows and Lemons

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(Received October, 20, 1985)

Peel oils of oranges, kinnows and lemons of Pakistani origin were analysed. The yield of oils on the basis of peels were 0.43, 0.68 and 0.53% and the monoterpene fractions of the oils were 91.89, 91.29 and 89.11% respectively. The GLC analysis of the monoterpene fractions showed limonene to be the predominant constituent occurring to the extent of 94.21, 95.41 and 81.20% respectively. The other monoterpenes present in small quantities were α-pinene, β-pinene, sabinene, myrcene γ-terpinene, p-cymene and terpinolene.

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ISOLATION AND IDENTIFICATION OF GALACTOSIDASES PRODUCING MOULD CULTURES FROM SOIL

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(Received June 12, 1982; revised March, 30, 1986)

More than thirty mould cultures capable of hydrolysing α-and β-galaccoside were isolated from local soil samples. *Aspergillii* and *Penicillia* were found to be dominant among the isolates. Members of the same species also exhibited variable enzyme producing capability.

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FLOWER INDUCTION IN *NICOTIANA TABACUM* CV. VIRGINICA IN STERILE CULTURE: EFFECT OF NUTRITIONAL AND ENVIRONMENTAL FACTORS

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(Received July 11, 1985; revised December 30, 1985)

Epidermal explants of *Nicotiana tabacum* cv. Virginica excised from fruiting branches of the inflorescence produced maximum number of flower buds when cultured on MS medium containing glycine and vitamins. Presence of GA_3 in the medium was found unsuitable for flower induction. The *in vitro* produced flower buds produced well developed green calyx whereas other organs were either absent or less developed. Adenine at relatively low concentrations permitted flower bud development on epidermal explants but their number was less than the respective control. 10^{-3}M adenine added to the MS medium was toxic for the survival of explants. Flower induction was found best in cultures kept in continuous light.

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EFFECT OF VANADIUM AND NITROGEN ON THE CHEMICAL COMPOSITION ON RICE

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(Received June 16, 1985; revised February 25, 1986)

A greenhouse study was conducted to explore the effect of vanadium and nitrogen application on the chemical composition of rice (IRRI-6). Vanadium application at the rates of 0.45, 0.90, 1.80 and 2.70 kg/ha caused a significant increase in the nitrogen percentage of both straw and paddy. The source of nitrogen urea and ammonium nitrate had no significant effect on nitrogen, phosphorus and potash content while vanadium increased their concentration and uptake both in straw and paddy. The vanadium concentrations both in straw and paddy were increased significantly by its application. The highest concentration of vanadium in straw and paddy was observed where it was applied at the rate of 2.70 kg/ha. The source of nitrogen did not show any significant effect upon vanadium concentration in straw and paddy.

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EFFECT OF FOUR PYRETHROIDS ON THE INSECT PESTS OF RAPE

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(Received August 5, 1985; revised December 18, 1985)

Cyahalothrin (PP 321 = Karate EC 2.5%), cypermethrin (Cymbush EC 10%), fenpropathrin (Danitol EC 10%), and fluvalinate (Mavrik EC 25%) were tested at their actual toxicant concentrations of 0.0017, 0.011, 0.011 and 0.033%, respectively, against the 3 pests of rape. The 2nd and 4th insecticides caused maximum reduction in the mustard aphid, *Lipaphis erysimi* (K.), population within 2 days of spray which were followed by the 1st and 3rd. Infestation levels of leaf miner, *Chromatomyia horticola* (Gour.), recorded 7 days post-treatment, were significantly lower in the treated than the untreated plots. All insecticides gave complete control of the cabbage butterfly, *Pieris brassicae* L., larvae within 1 day of spray.

Technology Section

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PRODUCTION OF STRONTIUM CARBONATE FROM CELESTITE

M. Arshad Ali Beg, Shamshad Ahmed Khan and Najmul Hasan

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(Received December 17, 1985; revised April 16, 1986)

A simple method has been developed to upgrade celestite ore containing 85 % $SrSO_4$ to 98.5 % by treatment with dilute hydrochloric acid at room temperature. Pilot plant experiments and material balance have been described for the production of strontium carbonate of 98.5 % purity from the upgraded ore by reacting with 12 % sodium carbonate solution for 30 min. at a temperature of 70° using minimum quantities of water.

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STUDIES ON THE PREPARATION OF TEMPEH AND TEMPEH KABABS

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(Received November 10, 1985; revised February 9, 1986)

Tempeh has been prepared from soybean cultivated in Pakistan by fermentation with *Rhizopus oligosporus* NRRL-2710 in shallow stainless steel trays. Excellent tempeh has been prepared after 20 hr incubation at 31°. The percentage of trypsin inhibitor has been determined at various stages involved during the tempeh formation. It was found to be maximum in the raw soybean and remained unchanged after soaking overnight. Boiling soybean for half an hour resulted in complete destruction of the trypsin inhibitor. After fermentation the other type of trypsin inhibitor was released which was completely destroyed by boiling the fermented material for 20 min. in water or deep fat frying. A procedure has been described for the preparation of tempeh and food preparations according to local conditions.

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WALL HEAT TRANSFER COEFFICIENTS OF DOWTHERM – A IN FIXED BEDS

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(Received February 17, 1985; revised September 2, 1985)

An experimental investigation into the effect of packing diameter, fluid velocity and thermal conductivity upon the wall heat transfer coefficients of Dowtherm-A, flowing in closed loop through a packed-bed reactor heated radially at the wall, has been made. Spherical and cylindrical shaped particles are employed as the packing material.

A theoretical equation is developed which could predict the wall heat transfer coefficients of Dowtherm. The values of heat transfer coefficients so obtained are compared with the experimental data; an agreement is found within an accuracy of ± 9%.

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DEHYDRATION OF CASTOR OIL OVER PAKISTANI BENTONITES

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(Received April 30, 1985; revised January 23, 1986)

Dehydration of castor oil has been attempted by passing the oil through a column packed with activated Pakistani bentonites as such or coated with various salts. The clay coated with $NaHSO_4$ gives the best results in terms of high iodine value and light colour of the product.