



ISSN 0030-9885

Coden: PSIRAA 41 (3) 113-166 (1998)

PAKISTAN JOURNAL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Vol. 41, No. 3, June 1998

Physical Sciences. Pages 113-150

Biological Sciences. Pages 151-163

Technology. Pages 164-166

Published bimonthly by

Scientific Information Centre

PAKISTAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
KARACHI

Physical Sciences Section

Pak J Sci Ind Res 1998 41 (3) 113 - 115

EFFECT OF AMMONIUM SULFATE-SULFUR MIXTURE ON THE DIFFUSIVITY AND INDEX OF ACTIVITY OF AMMONIUM SULFATE

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(Received 16 October 1995; accepted 6 January 1997)

This paper deals with the diffusivity characteristics and the index of activity of ammonium sulfate-sulfur mixture, slow release fertilizer through water. Sulfur used was pure agriculture sulfur as well as sulfur sludge from Abou Zaabal Fertilizer Company. Different practical and theoretical methods were used from which the diffusivity of ammonium sulfate-sulfur mixture through water was found and compared with that of ammonium sulfate fertilizer.

Key words: Slow release fertilizers, Ammonium sulfate fertilizer, Diffusion of ammonium sulfate.

REACTION KINETICS FOR THE LEACHING OF IMPURITIES FROM ROCK PHOSPHATE

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(Received 2 February 1997 accepted 16 August 1997)

This paper presents a kinetic study of the leaching of iron and magnesium impurities from rock phosphate with hydrochloric acid. The effects of particle size, stirring speed, hydrochloric acid concentration and reaction temperature on the leaching rate were investigated. The data fitted a shrinking core model equation with reaction rate controlled by a diffusion mechanism. The rate was related to temperature by the Arrhenius relationship with the apparent activation energy being 18.7 kJ mol⁻¹ for iron and 14.3 kJ mol⁻¹ for magnesium. The rate was linearly dependent on hydrochloric acid concentration and inversely proportional to the average diameter of the particles. The leaching rate of magnesium was relatively faster than that of iron but both exhibited similar leaching pattern under the same reaction conditions.

Key words: Impurities, Kinetics, Leaching, Rock phosphate.

KINETICS OF Mn^{2+} EXTRACTION IN THE ACIDIC CHLORIDE-D2EHPA-KEROSENE SYSTEM USING THE CONSTANT INTERFACIAL AREA STIRRED CELL TECHNIQUE

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(Received. 18 June 1996 accepted 20 September 1997)

Kinetics of the system ($\mu=0.1 \text{ kmol m}^{-3}$) have been studied over a wide range of Mn^{2+} concentration, pH, extractant concentration and temperature conditions using the constant interfacial area stirred cell technique. The reaction orders with respect to Mn^{2+} , D2EHPA (di-2-ethylhexylphosphoric acid, H_2R_2) and H^+ concentrations have been estimated to be +1, +1 and -1 respectively. The value of the rate constant, k_1 has been evaluated to be $10^{-6.534} \text{ m s}^{-1}$ at lower investigated pH region. Kinetic data at higher pH region appear to be erroneous due to the instantaneous variation of interfacial pH. Temperature dependence data give E_a values of 76.5 and 8.7 kJ mol^{-1} at lower and higher temperature regions respectively. The values of $\Delta S^\ddagger$ and $\Delta H^\ddagger$ have been evaluated. An analysis of the kinetic data suggests that the reaction step at the interfaces: $Mn^{2+} + HR_2 \rightarrow [Mn(HR_2)]^+(i)$, is the slowest at lower temperature region, and at the higher temperature region, the diffusion of the species to the interface to occur the above reaction is the slowest step. The entropy of activation suggests that the above reaction occurs through an SN_2 mechanism.

Key words: Extraction, Kinetics, Manganese(II), D2EHPA, Lewis cell, kerosene-HCl interface.

MIXED LIGAND COMPLEXES OF BIVALENT METAL IONS WITH 4,6-DIAMINO 2-HYDROXYPYRIMIDINE

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(Received 21 July 1996; accepted 15 November 1997)

The interaction of Mn(II), Co(II), Ni(II), Cu(II) and Zn(II) ions with 4,6-diamino 2-hydroxy pyrimidine in presence of biologically important ligands like oxalic acid, malonic acid, o-amino phenol, o-phenylenediamine, 2,2'-bipyridyl, 1,10-phenanthroline and ethylenediamine has been investigated by potentiometric studies. The proton dissociation constant of the substituted pyrimidine, stability constant of the binary complexes of 1:1 and ternary complexes of 1:1:1 molar ratios of the metal ion to ligands have been reported at 35°C and 0.1 M (KNO₃) ionic strength.

Key words: Mixed ligand complexes, Bivalent metal ion, 4,6-Diamino 2-hydroxypyrimidine, Stability constant.

ACTIVATION OF D.G. KHAN FULLER'S EARTH WITH HYDROCHLORIC ACID

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(Received 10 June 1997; accepted 25 November 1997)

Acid activation of washed D.G. Khan fuller's earth has been investigated with regard to parameters such as concentration of acid, percentage of slurry solids, duration of heating and temperature. It has been found that the fuller's earth may be activated to a maximum possible degree with varying sets of these parameters. The maximum activation achieved with (HCl) 6N acidulation for 2 hours activation time is suitable for producing a commercially acceptable product.

Key words: Activation, Clay, Hydrochloric acid.

EFFECT OF Al_2O_3 AND B_2O_3 ON SELENIUM RUBY GLASSES FOR RED SIGNALS

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(Received 5 November 1996; accepted 27 November 1997)

This paper presents the results of some investigations on the melting of selenium ruby glasses, particularly on the effect of Al_2O_3 and B_2O_3 on ruby colour. A glass of base composition (wt. %) SiO_2 65.0, Na_2O 15.5, K_2O 5.3, ZnO 12.0, B_2O_3 1.0, CdS 0.6, Se 0.6 has been chosen for these studies. To this glass Al_2O_3 and B_2O_3 are systematically substituted for Na_2O in small amounts from 0.5 to 3.0%. Effects of these substitutions on melting, refining, colour, striking temperature etc. have been recorded. Transmittance of some representative samples has been determined. Glasses containing Al_2O_3 1.5 and 2.0% and having B_2O_3 2.0 to 3.0% alongwith 1.0% Al_2O_3 have been found suitable for the development of red signal glasses. Pilot Plant meltings also gave satisfactory results.

Key words: Selenium glass, Ruby glass, Red signal glass.

STUDIES ON THE LEACHING OF COPPER FROM COMPLEX COPPER ORES OF CHITRAL

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(Received 4 August 1993; accepted 6 January 1998)

Mineralogical and chemical studies have indicated potential deposits of complex ores containing minerals of copper, zinc, lead and silver in Dir and Chitral District of Pakistan. Pressure and agitation leaching studies were carried out for the extraction of copper and associated metals under varying parameters by using H_2SO_4 in complex copper ores (average 1.27% Cu), reported to occur in Kaldam Gol area, (District Chitral, NWFP, Pakistan). The maximum recovery of copper obtained at 100°C with 1.87 M H_2SO_4 and 0.5 M HNO_3 for 30 minutes stirring at atmospheric pressure was 35%. On the other hand the maximum recovery of copper with pressure leaching at the same condition at > than 70 atmosphere pressure was doubled i. e. 87%. The conditions for maximum recovery of copper by leaching are presented for these ores.

Key words: Leaching, Agitation, Chalcopyrite, Extraction.

THE EFFECT OF AMINO ACIDS ON THE ADSORPTION OF DIRECT RED ON CELLULOSE FIBRES

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(Received 6 February 1995; accepted 4 February 1998)

Equilibrium adsorption isotherms and rates of dyeing for Direct Red on cotton fibres pretreated with solutions of Valine, Threonine, Proline and Histidine in aqueous acetic acid were measured. Amino acid treatment increased the rate of dyeing with Direct Red and improved the wet fastness properties of the dyed cotton. At lower concentrations of amino acids, the order of exhaustion value was Threonine > Valine > Proline > Histidine whereas at higher concentrations, the order changed as Threonine > Proline > Valine > Histidine.

Key words: Direct red dye, Amino acids, Cellulose fibre, Dyeing rate.

Biological Sciences Section

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STUDIES ON THE PROTEOLYTIC ACTIVITY OF PAPAYA JUICE

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(Received 4 February 1996; accepted 5 August 1997)

The activity of proteases in crude papaya juice *Carica papaya* was studied by using casein as a substrate. The activity of enzyme in papaya juice was optimum at pH 8.0 and temperature 80-85°C. The crude juice was heat stable and exhibited about 8-10 fold increase in activity at 85°C. Cysteine hydrochloride and sodium cyanide showed a marked activating effect at optimum temperature.

Key words: Papaya juice, Plant proteases, Proteolytic activity, Activating agents.

PHOTOSYNTHETIC EFFICIENCY OF WHEAT UNDER WATER STRESS CONDITIONS

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(Received 2 November 1994; accepted 25 September 1997)

An experiment was conducted in cemented tanks with four wheat genotypes: two were tolerant (Chakwal-86 and AZS-4) and two susceptible (Pavon and AZS-17) to water stress. The parameters estimated were the photosynthetic efficiency and nitrogen metabolism of the genotypes. Measurements were made of accumulation of dry matter, transpiration, leaf diffusive resistance, leaf area, nitrate reductase activity (NRA) and total amino acids. Results showed that leaf area, transpiration, dry matter accumulation and NRA were reduced while leaf diffusive resistance and total amino acids increased in all the genotypes under all stress treatments. The relationship between yield and leaf area, transpiration, dry matter accumulation and NRA was positive. The genotypes Chakwal-86 and AZS-4 showed better performance than the others.

Key words: Wheat, Photosynthetic efficiency, Water stress.

Technology Section

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MEASUREMENT OF THERMAL CONDUCTIVITY OF MARBLE POWDER BY SPHERICAL SHELL METHOD

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(Received 25 July 1996; accepted 8 May 1998)

An apparatus, designed and developed for the measurement of thermal conductivity 'K' of powdered material by spherical shell method, has been described. Extrapolation of straight line graph of K-values against varying densities of different mesh sized powder material gives K-value of lumps of marble. It does not give K-value of solid material because the density of compressed powder can not be equivalent to the density of natural marble. K-values of different mesh sizes marble powder have been determined and results are discussed with reference to the data already available in literature.

Key Words: Thermal conductivity, Spherical shell method, Marble powder
