

## **NON-INVASIVE MONITORING OF THE PHYSIOLOGICAL STATE OF MICROBIAL CULTURES**

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### **ABSTRACT**

In attempts to improve the performance of bioprocess modelling and control it is becoming clear that alternative methods to access information on biological systems, better suited to the nature of living systems, have to be developed. Three considerably different approaches have been proposed to access this information and are here reviewed. Optical methods approach relies on enzymes or metabolites which change their optical absorption or fluorescent emission as a function of specific or induced cellular alteration. <sup>31</sup>P nuclear magnetic resonance (NMR) can be used for the determination of energy carrying phosphorous compounds. On-line monitoring of the physiological state of the living matter in bioreactors uses knowledge-based recognition systems to access variables that indicate the physiological state.

**FOURIER-TRANSFORM INFRARED SPECTRA OF TETRAAMMINE-COPPER(II) CHROMATE : COMPARISON WITH THE SPECTRA OF TETRAAMMINECOPPER(II) SELENATE<sup>1</sup>**

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**ABSTRACT**

Analyzed were the Fourier-transform infrared (FTIR) spectra of tetraamminecopper(II) chromate recorded at room-temperature (RT) and at the boiling temperature of liquid nitrogen (LNT). Also analyzed were the spectra of a partially deuterated analogue of the title compound. The similarities between the infrared spectra of  $[\text{Cu}(\text{NH}_3)_4]\text{CrO}_4$  and  $[\text{Cu}(\text{NH}_3)_4]\text{SeO}_4$  indicate that structural similarities between the two compounds exist as well. The hydrogen bonds formed between the ammonia molecules and the chromate anions are not appreciably different in strength from those formed in the case when the selenate ions play the role of proton-acceptors.

## COMPATIBILIZING EFFECTS OF STYRENIC BLOCK COPOLYMERS IN POLYPROPYLENE/POLYSTYRENE BLENDS

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### Abstract

Morphology and mechanical properties of immiscible polymer blends of isotactic polypropylene (PP) and atactic polystyrene (PS) have been investigated. The effect of the addition of poly(styrene-*b*-butadiene-*b*-styrene) (SBS) and poly(styrene-*b*-ethylene-*co*-propylene) (SEP) on changes of morphology and mechanical properties of PP/PS blends has also been studied. Binary and ternary blends with different weight ratios of PP and PS were prepared in the melt in Brabender kneading chamber. Scanning electron microscopy was used for the determination of the blends morphologies. Notched impact strength, Young's modulus, yield stress and elongation at yield were measured. An obvious decrease in dispersed particle dimensions of PS is observed with the addition of only 5wt.% of block copolymers SBS and SEP. Mechanical properties were affected because of the morphological changes. Notched impact strength and elongation at yield were substantially improved. Some theoretical models showed to be adequate to predict the values of Young's modulus and yield stress of such binary PP/PS blends.

## THE DENSITY AND THERMAL EXPANSION COEFFICIENT OF SOME EDIBLE OILS

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### ABSTRACT

For six types of edible oil, namely olive, sunflower, refined sunflower, refined corn germ, pumpkin seed and salad oil, the peroxide, iodine, acid and saponification values were determined. From the densities of the investigated samples, determined in the temperature range from 298.15 K to 328.15 K in intervals of 5.0 K, the thermal expansion coefficients were deduced. On the basis of the experimentally determined refractive indices and densities, we calculated the specific refraction and Eykman's constants of these samples. The parameters obtained were correlated with the structural characteristics of the oils.

# ON MOLECULAR BRANCHING\*

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## ABSTRACT

A novel branching index  $\lambda\lambda_1$  is proposed. It represents the leading eigenvalue of the matrix in which the element  $(i, j)$  is given by the leading eigenvalue of the path graph connecting vertices  $i, j$ . We list novel branching index for heptane and octane isomers. The new index shows higher discrimination power than the simple branching indices  $W$  and  $\lambda_1$ . The new index was used to correlate motor octane numbers, believed to strongly depend on molecular branching. The article ends with a list of open questions.

## MODELS FOR AQUEOUS SOLUTIONS OF ALKALINE p-TOLUENESULPHONATES

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### Abstract

Osmotic coefficients, enthalpies of dilution and apparent molar volumes of aqueous solutions of lithium, sodium and potassium salts of p-toluenesulphonic acid at 25° C were studied using a refined model of the electrolyte solution and the hypernetted chain integral equation. The model (P.S. Ramanathan and H.L. Friedman, *J. Chem. Phys.* 54, 1086 (1971)) supposes that each ion is surrounded by a domain of structure-modified water, called the cosphere. The main parameters of the model are the Gurney coefficients  $A_{ij}$  which represent the free energy change of water displaced when two cospheres overlap. These parameters were adjusted to fit the experimental results for the osmotic coefficient. The temperature ( $S_{ij}$ ) and pressure ( $V_{ij}$ ) derivatives of the Gurney coefficients  $A_{ij}$  were determined from comparison of the model calculation with the heats of dilution and apparent molar volume data, respectively. Results of the analysis indicate an association of the p-toluenesulphonate anions at higher concentrations. Further, the coefficients  $A_{+}$  show regularity with variation of alkali ions which is consistent with our knowledge about their behaviour in water solutions: e.g. the lithium ion acts as a structure-maker and the potassium ion as a weak structure-breaker. The analysis also yields the coefficients  $S_{ij}$  and  $V_{ij}$ , but these values are not always consistent and have to be considered as preliminary.

SYNTHESIS OF SOME NEW POTENTIAL BIOLOGICALLY ACTIVE  
1,4-DIHYDROPYRIDINES

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ABSTRACT

In order to prepare some new pharmacologically interesting 1,4-dihydropyridines dimethyl and ethyl methyl 1,4-dihydro-2,6-dimethyl-4-(3-nitrophenyl)-3,5-pyridinedicarboxylate (1a and 1b) were reduced to amine analogs (2) and then converted to amides (3, 4 and 8) and enamines (5, 7 and 8). Expected regioselectivity of reactions was observed.

# INTERFACIAL REACTION IN MULTILAYER STRUCTURES STUDIED WITH X-RAY DIFFRACTION AND CROSS- SECTIONAL TRANSMISSION ELECTRON MICROSCOPY

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## **Abstract**

Very thin alternating layers are of interest both from a theoretical as well as a practical point of view. In this paper, the basic physical properties, preparation procedure, characterization techniques and industrial importance of such structures are described. The emphasis is placed on X-ray diffraction (XRD) and cross sectional transmission electron microscopy (XTEM) as a most commonly used techniques for structural characterization of multilayers. The interdiffusion and reactions reactions between the layers of selected multilayer systems during thermal annealing were studied.

## STRUCTURAL STUDIES OF THE HALOPYRIDINE COMPLEXES OF TRIVALENT ELEMENTS

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**Abstract.** Halopyridine complexes of trivalent elements are known for about 100 years, but the first two crystal structures, namely  $W_2Cl_6py_4$  and  $trans-TiCl_3py_3py$  ( $py=pyridine, C_5H_5N$ ) were published yet in the years 1971 and 1972.

The majority of monomeric halopyridine complexes of the trivalent metals have octahedral coordination described by formula  $[MX_npy_{6-n}]^{(3-n)}$  ( $n=1-5$ ). Five different stoichiometries make possible eight structural types. Out of eight possibilities five have known crystal structures:  $[MX_3py]^{2-}$ ,  $trans$  and  $cis-[MX_4py_2]^{+}$ ,  $mer-[MX_3py_3]$  and  $trans-[MX_2py_4]^{+}$ . From the nonoctahedral complexes only  $TiBr_3py_2$  with distorted trigonal-bipyramidal structure is known. Three of dimeric  $M_2X_6py_4$  complexes were also characterised by crystal structure analysis.