

The elimination of Cadmium (II) from aqueous environment by Supported Liquid Membrane method using the basic carrier

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ABSTRACT

The transport of cadmium ions through a supported liquid membrane containing triethanolamine (TEA) as a mobile carrier has been studied. The effects of Cd(II) concentration, HCl in feed and carrier concentration in membrane has been studied. Cd(II) concentration increase in feed leads to an increase in flux from 2.1×10^{-7} to $8.4 \times 10^{-7} \text{ mol-cm}^{-2}\text{-sec}^{-1}$ within Cd(II) ions concentration range ($2.7 \times 10^{-4} \text{M}$ - $16.37 \times 10^{-4} \text{M}$) at 2.0M HCl in the feed and 3.0M triethanolamine in the membrane. Increase in H^+ ion concentration from 0.5M to 3.0M results in an increase in Cd(II) ions flux but a decrease is observed beyond 2.0M HCl concentration in feed. Increase in carrier concentration in the liquid inside the membrane enhances the flux with its maxima at 3.0M carrier. Further increase in the concentration of TEA leads to a decrease in transport due to increase in viscosity of membrane liquid. The optimum conditions for Cd(II) ions transport are, 2.0M HCl in feed, 3.0M TEA in membrane and 0.1M NaOH as strip solution. Similar transport characteristics have been observed for Cd-EDTA complexed anions across TEA-cyclohexanone based SLM, thus indicating a cadmium anion transport coupled with protons and chloride or EDTA co-ions.

Key words: cadmium, triethanolamine, supported liquid membrane, waste effluent

Characterization of Saudi Arabian floral honeys by their physicochemical characteristics and heavy metal contents

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The quality of floral honey produced in Saudi Arabia was evaluated. All samples were analyzed for common physicochemical parameters like moisture contents, acidity, ash, pH, conductivity and heavy metal contents. All samples showed proper maturity, considering the low moisture percentage. The total acidity, below 50 meq/kg, in all the samples indicated the absence of undesirable fermentation. Also, the mean pH around 4.0, is usual for floral honeys. The value for ash and conductivity (0.33% and 402 μ S/cm) were within the European Community Standards. Among heavy metals, Fe and Zn were detected in all samples, with the mean levels of 2.65 μ g/g and 0.77 μ g/g. Nickel was detected only in 20% of samples analyzed. The heavy metal contents of Saudi Arabian floral honey were either comparable or lesser than internationally reported values. Therefore, these can be regarded as safe for human consumption.

Key Words: Floral honey; Heavy Metals; ICP-AES; Saudi Arabia; Physicochemical parameters

Levels of Selected Heavy Metals in Black Tea Varieties Consumed in Saudi Arabia

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Abstract

The metal contents (Fe, Cu, Zn, Mn, Cr, Pb, Ni, Cd, Co) of seventeen black tea samples were analyzed by using Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES). Among the investigated metals Mn was the highest (1071.7 µg/g), whereas Pb showed minimum levels (0.30 µg/g). Iron was the second highest element found in black tea samples. Lowest Pb concentration (0.30 µg/g) was found in Abu Jabal tea; whereas maximum (2.2 µg/g) was found in Manasul tea. Lowest Cd concentration was found in Lipton whereas maximum level was observed for Al-Diafa tea. The concentrations of Co and Zn in the analyzed samples were in the range of 4.5-17.4 µg/g and 23.7-122.4 µg/g, respectively. Metal-to-metal correlation studies showed strong correlations between iron-chromium, iron-cadmium and lead-copper pairs. The data obtained in the present work compared well with the counterpart data reported internationally. Based upon the present safety standards, the tea versions selected in the present study were found to be safe for human consumption.

Key words: Heavy metals; ICP; Black Tea; Saudi Arabia

Separation and Preconcentration of Metal Ions through Crown Ether Supported Liquid Membranes

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Abstract

The transport behavior of Ag^+ , Cu^{++} and Zn^{++} across supported liquid membrane using dithio-18-crown-6 (DT18C6) and dicyclohexano-18-crown-6 (DC18C6) in chloroform, has been investigated. Phase distribution studies show that selectivity of the interface is much higher when the metal cation is inserted deeper in the polyether cavity. Ag^+ specie are more adaptable to the cavities of DT18C6 and DC18C6 than are Cu^{++} and Zn^{++} . Transport studies showed that fluxes obtained with DT18C6 were slightly lower than those of DC18C6 for all three ions studied. Use of different solid supports revealed that fluxes increase with increasing porosity of the support but decrease with increasing thickness. Differences in molar flow rates (F) at feed and strip membrane interfaces were observed. The magnitude of separation factor ($\text{SF}=2.51$) showed that Ag^+ could very well be separated from Cu^{++} and Zn^{++} using DC18C6/chloroform membrane. The feasibility of preconcentration of Ag^+ was also studied by using the hollow fiber module system. Highest enrichment factor (EF) was obtained for 40mg/L whereby all the metal ions were transported to the stripping phase and resulting Ag^+ concentration was 490mg/L ($\text{EF}=12.3$).

Keywords: SLM; Crown ethers; Enrichment Factors; Separation Factors

Short Running Title: Metal Separation & Preconcentration

Heavy Metals Contents in Kidney and Heart Tissues of *Scarus Ghobban* Fish from the Arabian Gulf

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Abstract

Levels of selected heavy metals (Pb, Co, Cu, Ni, Zn, Mn and Cu) in the heart and kidney tissues of parrot fish (scarus ghobban), collected from the Arabian Gulf, Eastern Province of Saudi Arabia, were determined by wet-digestion based atomic absorption method. The results showed that accumulation pattern of analyzed metals in the kidney tissues followed the order; Zn > Cu > Co > Pb > Ni > Mn > Cd, with Pb at 1.05±0.63 ppm and Cd at 0.27±0.20 ppm. In the heart tissue the analyzed metals followed similar pattern of metal accumulation. The average Pb (0.85±0.50 ppm), Cd (0.12±0.07 ppm), Ni (0.92±0.35 ppm) and Mn(0.86±0.43 ppm) were significantly lower in the heart tissue whereas Zn (26.4±12.9 ppm) and Cu (3.29±2.18 ppm) were higher in the kidney tissues. In general, the data indicated that marine fish from the sampling site of the Arabian Gulf contain relatively less burden of heavy metals in their tissues.

Keywords: Arabian Gulf; Fish; Kidney & Heart Tissue; Heavy Metals

Total Petroleum Hydrocarbon (TPH) Burden in Fish Tissues from the Arabian Gulf

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Abstract

The levels of total petroleum hydrocarbons (TPH) and lipid contents have been reported for eight commercially important fish species from the Arabian Gulf. GC-FID has been used as quantification technique. Out of the species analyzed, Scarus Ghabon showed the highest level of TPH ($7.4 \pm 3.2 \mu\text{g-g}^{-1}$) in the muscle tissue followed by Epinephelus Tauvina ($6.8 \pm 3.6 \mu\text{g-g}^{-1}$). Except for Epinephelus Microdon ($4.8 \pm 2.1 \mu\text{g-g}^{-1}$), all other fish species showed a similar level of TPH concentration. Significant correlations were obtained between lipid contents and TPH levels in the muscles of the fish. Body weight of the fish was also found to be strongly correlated with TPH concentration in the muscle tissue. There is a tendency of accumulating higher TPH in the winter season as compared to in the summer season.

Key Words: TPH; Lipids; Fish; Muscle Tissue; Seasonal Variation; Gulf