Summary

This work has been done in an attempt to prepare inorganic ion exchangers, that can be of help in understanding and improving the ion exchange process. And knowing the electrical conductivities process, which are characterized by tin (IV) antimonate among the solid inorganic ion exchangers.

Chapter I, introduction which includes the advantages of the inorganic ion exchangers over the organic resins, and a literature survey covering, almost, the last three decades related to the propsed subject.

Chapter II, the experimental work, which includes method of the preparation of tin (IV) antimonate materials. The experimental includes the chemicals used, the equipments used in determination and analysis measurements.

In Chapter III , results and discussion of characterization of tin (IV) antimonate by using the XRD, DTA-TGA, IR spectrophotometer and thermal analysis.

The results showed that tin (IV) antimonate has amorphous structure, water content could be determined with calcination till 800°C, tin (IV) antimonate showed thermal stability up to 650 °C.

The effect of hydrogen ion concentration was studied. It was found that each mole of hydorgen ion in tin (IV) antimonate compound is replaced by only one mole of Na^+, K^+ and Li^+, but in case of Co^{2+} each two mole of hydrogen ion is replaced by one mole of Co^{2+} ion. The effect of metal ion concentration on the distribution coefficient found that , there is a steady decrease in the distribution coefficients (Kd) values with the increase in the metal ion concentration. Also,the effect

of the molar ratios of tin (IV) antimonate with Na^+, K^+, Li^+, and Co^{2+} metal ions were studied, where it is found that the maximum uptake with the molar ratio Sb/Sn 1.5.

The effect of UV light on the solid ion exchanger tin (IV) antimonate was studied, and found that this effect of UV light causes no structural change of the exchanger under investigation, consequently there is no change in the distribution coefficient values with the alkali metals. Kinetics of exchange was studied as a function of particle diameter and solution concentration, the diffusion coefficient, Di, values were calculated for the metals under investigation. The Di values increase with increasing the particle size (0.160 to 0.325 mm), it was concluded that the interdiffusion coefficient strongly depends on the particle diameter of the ion exchanger and also on the ion under the exchanger process. The energy of activation was calculated as well as the entropy of the exchange where entropy ΔS^* ranges between. -27.49 J mol^{-1} K^{-1} for Na^+ and -88.55 J mol^{-1} K^{-1} for Li^+ ion.

The saturation capacity was calculated from the Langmuir adsorption isotherm. The results indicates that,the saturation capacity M for Na^+ is 3.33, K^+ is 0.588, Li^+ is 0.25 and for Co^{2+} is 0.4 meq. g^{-1}.

In terms of the saturation capacities of tin (IV) antimonate, it seems to be a better sorbing for Na^+ than the other cations used in this work under the conditions of this study.

The electrical conductivity behavior of tin (IV) antimonate of different Sb/Sn molar ratios; it is found that the activation energy, Ea for the different ratios varied between 17.37 and 82.98 kJ. mole $^{-1}$.

This indicates that tin (IV) antimonate has a conductivity behavior as that of semiconductors.

From the results obtained and the presented discussion, it can be recommended the prepared inorganic exchanger tin (IV) antimonate for the use in the treatment and removal of cobalt from waste of the cooling system of nuclear reactors, also any salts contains Na^+, K^+, Li^+ as impurities can be purified.

This purpose needs further study which is under investigation.