CHAPTER 4

CONCLUSION

Speciation analysis of tin in wastewater from electronic industry has progressively become important. Recently, tin is used in most industries that leads to the contamination of tin in environmental. The solid phase extraction is also found very important place in the speciation studies of tin species. The ion exchange was widely employed in chemical separation procedure, because of its advantage of relative simplicity in the operation and high pre-concentration factor. In this work, the separation method of tin speciation in wastewater sample was studied by combination of solid phase extraction on Amberlite IRA-400 resin and determination of tin amount by graphite furnace atomic absorption spectrometry (GFAAS). The procedure is based on the solid phase extraction of the Sn(IV)-Amberlite IRA-400 chelating resin which Sn(IV) was adsorbed on. Then, Sn(IV) was eluted with NaOH. The optimum conditions in this study were obtained by the maximum of Sn(IV) condition. In this work, the suitable conditions for separation of Sn(IV) on solid phase extraction were 5.0 M HCl concentration, 2.0 M NaOH concentration, flow rate at 2.0 ml/min, 400 mg of resin amount, sample volume of 20 ml, eluent volume of 3.0 ml and time on the adsorption of 2.0 hours. The selected conditions will be employed in real samples. For the study on effect of interfering ions on determination of Sn(IV), the results showed that the recoveries of Sn(IV) and interfering ions were in the range of 84-92% and 84-104%, respectively. From the results, the determination of Sn(IV) was not interfered with by the interfering ions when the concentrations of interfering ions were in the range of 0.1-1000 mg/l.

For the determination of tin speciation in real samples, the proposed method was applied to determine the concentration of tin speciation in wastewater samples. The No. 1, No. 2, No. 3, No. 4, No. 5, No. 6, No. 7 and No. 8 wastewater samples were collected from Chiang Mai and Lumphun province (northern industrial estate of Thailand). From the results, the determination of Sn(IV) in wastewater samples were found in the range of 125.76-205.44 µg/l. The Sn(IV) concentration in wastewater samples can be ordered as following: No. 7 > No. 5 > No. 6 > No. 1 > No. 4> No. 8 > No. 2 > No. 3, respectively.

The accuracy expressed in term of percentage recovery of this method for Sn(IV) was found in the range of 81.25-100.95%. The limit of detection was 2.57 µg/l. The precession expressed in term of relative standard deviation (%RSD) was found to be 2.28%. And the linear range of Sn calibration curve was obtained in the range of 30-150 ppb which given the correlation coefficient (R^2) in the recovery of 0.9909-0.9981.

The total tin in wastewater samples was determined as Sn(IV) after oxidation of Sn(II) to Sn(IV). The oxidation of Sn(II) to Sn(IV) was prepared by wet digestion with concentrated HNO_3 and H_2O_2 solution using hot plate and followed by analysis of tin concentration by GFAAS. From the results, the total tin in the studied wastewater samples was in the range of 1261.71-3068.00 µg/l. The determination of total Sn in the studied wastewater samples can be ordered as following: No. 7 > No. 8 > No. 2 > No. 6 > No. 3 > No. 5 > No. 4 > No. 1, respectively. The concentration of Sn(II) was calculated by subtracting the content of Sn(IV) from total Sn content. From the results, the concentrations of Sn(II) in wastewater samples were in the range of 1191.31-2863.00 µg/l.

For the determination of Sn(IV) in all studied samples, the results shown that the concentration of total tin and Sn(IV) in No. 7 sample was the highest of all samples. The concentration of Sn(IV) in No. 3 sample was lower than those in all studied samples. Furthermore, the information of tin speciation will be useful for evaluation hazardous level of tin in wastewater from industry before releasing to the rivers and environment.

The proposed method could be applied to separate Sn(IV) from Sn(II) using Amberlite IRA-400 resin with the relative standard deviation was 2.28 % and the limit of detection was 2.57 µg/l. No interferic effects observed from the various interfering ions. The procedure presented is simple, facile, accurate and economic. The proposed method was successfully applied to determine of tin speciation in wastewater samples.