

## CHAPTER V

### CONCLUSION

According to the results shown in Tables 4.1 - 4.10, the equilibration time is 40 minutes and 50 minutes for methylene chloride at 192.95 and 964.75 ppb, respectively, 50 minutes for chloroform at 188.10 and 940.40 ppb, 50 minutes for carbon tetrachloride at 199.71 and 998.57 ppb, 50 and 60 minutes for 1,1,1-trichloroethane at 199.44 and 997.21 ppb, respectively and 40 minutes for trichloroethylene at both 194.60 and 973.01 ppb. Therefore, 60 minutes is chosen as the equilibration time. To increase the sensitivity of this technique, various factors such as temperature, liquid to gas phase ratio, injection volume and salting out effect are studied and the results are shown in Tables 4.6 - 4.28. The temperature at 60 °C, the liquid to gas phase volume ratio of 30:30 in 60 mL serum vial and the injection volume of 1.50 mL are selected as the optimum headspace analysis condition and it would give a better sensitivity for the determination of the volatile chlorinated hydrocarbons in water samples. The effect of adding salt i.e., calcium carbonate, sodium chloride and anhydrous sodium sulfate into the solution on the sensitivity and the percent recovery is also studied and the results show that the anhydrous sodium sulfate gives the highest sensitivity and percent recovery for each interested compound. Hence, the anhydrous sodium sulfate is a suitable salt to be used for their determination in water samples. Therefore, the

following condition namely liquid to gas phase volume ratio of 30:30, equilibration at 60 °C for 60 minutes, injection volume of 1.50 mL and 13.00 g anhydrous sodium sulfate is selected as the optimal headspace analysis condition for the determination of the volatile chlorinated hydrocarbons in water samples.

The accuracy of this technique is also evaluated by determining the unknown synthetic mixture solution using internal standardization method and the results are shown in Table 4.33. The percent error is in the range of 0.31 - 6.44.

To verify that this technique is suitable for the analysis of real samples, six water samples collected from several places are analyzed by this headspace technique and the results of the analysis indicated that all water samples seem to have methylene chloride and chloroform in the range of 10.22 - 448.68 ppb and 0.22 - 31.86 ppb, respectively.

From the results of the studies, it can be concluded that the headspace technique developed for the trace analysis of the volatile chlorinated hydrocarbon in water samples is simple, precise, accurate and economic method.

For the future work, the studies of the different salts should be interested in order to enhance the sensitivity and the percent recovery of this technique. The investigation of the other volatile organic compounds in water samples and in the various environmental samples should be also considered by using the headspace technique.