

## CHAPTER 4

### Conclusion

#### 4.1 Cathodic stripping voltammetric method for determination of inorganic arsenic

The square wave cathodic stripping voltammetry (SWCSV) with a hanging mercury drop electrode (HMDE) was developed for determination of inorganic arsenic. In this study the analytical conditions for the measurement of  $\text{As}^{\text{III}}$  by CSV in the presence of copper and sodium diethyldithiocarbamate (Na-DDTC) which improved the sensitivity of the analysis has been optimized. The proposed method only measures  $\text{As}^{\text{III}}$ , the reduction of  $\text{As}^{\text{V}}$  to  $\text{As}^{\text{III}}$  is essential prior to CSV analysis. Therefore, thiosulfate was selected for reduction of  $\text{As}^{\text{V}}$  to  $\text{As}^{\text{III}}$ . The process is simple and no need to heat the solution. The CSV analysis under the optimized conditions (Table 3.3) provided advantages of being simple, requiring low-cost equipment and inexpensive reagents, while it was sensitive, simple, and convenient, using the same set of voltammetric conditions and chemical parameters for CSV determination of both  $\text{As}^{\text{III}}$  and  $\text{As}^{\text{V}}$ . The linear calibration graph in concentration ranges of 2-30  $\mu\text{g L}^{-1}$   $\text{As}^{\text{III}}$  ( $y = 0.2921x + 0.5014$ ;  $r^2 = 0.9921$ ) in absence of Na-DDTC and 0.1-0.6  $\mu\text{g L}^{-1}$   $\text{As}^{\text{III}}$  ( $y = 2.7241x + 0.2428$ ;  $r^2 = 0.9990$ ) in presence of NA-DDTC were obtained. The limit of detection of CSV system in absence of Na-DDTC and presence of Na-DDTC were found to be 0.45  $\mu\text{g L}^{-1}$  and 0.22  $\text{ng L}^{-1}$ , respectively.

Unfortunately, this proposed method could not be applied for real water sample analysis because its reproducibility is poor and the deteriorate of sensitivity was occurred. The attempt to solve this problem was carried out as described in section 3.1.9, but it is not successful.

#### 4.2 Cyclic voltammetric method for determination of arsenate

The cyclic voltammetry with glassy carbon electrode was developed for determination of  $\text{As}^{\text{V}}$ . The proposed method was based on the molybdenum blue reaction with electrochemical detection. The method is simple, using low-cost equipment, simple chemicals and convenient operation for the determination of arsenate. Under the optimum conditions, the linear calibration graph in ranges of 10-100  $\mu\text{g L}^{-1} \text{As}^{\text{V}}$  ( $y = 0.0006x + 0.0275$ ,  $r^2 = 0.9977$ ), 0.05-0.4  $\text{mg L}^{-1} \text{As}^{\text{V}}$  ( $y = 0.6102x + 0.0255$ ,  $r^2 = 0.9985$ ) and 1-10  $\text{mg L}^{-1} \text{As}^{\text{V}}$  ( $y = 0.1127x + 0.2636$ ,  $r^2 = 0.996$ ) were obtained. The limit of detection was  $6.94 \text{ ng L}^{-1}$ . The relative standard deviations of 11 replicates were 3.72% for  $50 \mu\text{g L}^{-1}$  and 2.71% for  $0.2 \text{ mg L}^{-1} \text{As}^{\text{V}}$ . The developed method was successfully applied to real water samples.