CHAPTER V

CONCLUTION

Since nowadays, silver ion and silver nanoparticles are used in several industries. However, researchers have serious concern about the toxicity of silver ion and silver nanoparticles to human, animal and environment. Therefore the determination of silver ion and silver nanoparticles is important. Bulk optode is optical sensor for metal ions determination because it has several advantages such as simple preparation, low cost of instrument, high selectivity, fast response time, reversibility, repeatability and this technique can be detected by naked-eye.

We have successfully fabricated the optode membranes for applying to determine silver ion in commercial real samples. This optode membrane incorporating 25,27-di(benzo thiazolyl)-26,28-dihydroxycalix [4]arene (CU1) as a silver-selective ionophore, 9-(diethylamino)-5-(octadecanoylimino)-5H-benzo[*a*]phenoxazine (Chromoionophore I) as a proton selective neutral chromoionophore and potassium tetrakis(4-chloro phenyl borate) (KT*p*ClPB) as an ion-exchanger plasticized in PVC membrane using DOS as plasticizer was prepared. It was found that the optimized composition of the optode membrane was 5.98, 7.47 and 10.94 mmol kg^{-1} for Chromoionophore I, KT*p*ClPB and CU1, respectively. The fabricated optode membranes can be kept within 2 weeks before use with good reproducibility. It responded to silver ion by changing in the absorption of chromoionophore at pH 8.0-8.5 within the response time of 10 min. It also provided a calibration response over a wide concentration range of 10^{-5}-10^{-2} mol L^{-1} which also could be detected by naked-eye. This is one of advantage of the bulk optode technique that can be applied for the fieldwork application. The lower detection limit of 7.83×10^{-6} mol L^{-1} and the upper detection limit of 1.58×10^{-2} mol L^{-1} were obtained. Moreover, the optode membrane could be reused by immersing in 1 mol L^{-1} HNO_3 solution for 5 min to release silver ion from membrane to aqueous solution. The proposed optode displayed a good selectivity toward silver ion over other cations in the order of silver ion > sodium ion > potassium ion > mercury ion > calcium ion. Finally, the fabricated optode membranes were successfully applied to determine silver ion in cleansing

water with the percentage recovery of 92-93%. They also provided the percentage recovery in the range of 104-109% in the case of silver nanoparticles solution by spiked method indicating that this method was also possible to apply to determine silver nanoparticles in form of silver ion in commercial real samples as cleansing water.

Suggestion in the future works

The response time and the detection limit for determination of silver ion can be improved by using optode membrane in flow-through system.