

4036377 SCAI/M: MAJOR: APPLIED ANALYTICAL AND INORGANIC CHEMISTRY;  
M. Sc. (APPLIED ANALYTICAL AND INORGANIC CHEMISTRY)

KEY WORDS : URINARY IODINE/ STOP-FLOW INJECTION/ CATALYTIC  
REACTION

NUANLAOR RATTANAWIMANWONG: STUDIES OF FLOW INJECTION  
TECHNIQUE FOR DETERMINATION OF IODINE IN URINE BY CATALYTIC  
REACTION THESIS ADVISOR: DUANGJAI NACAPRICHA, Ph. D., PRAPIN  
WILAIRAT, Ph. D., JUWADEE SHIOWATANA, Ph. D. 104 p. ISBN 974-664-345-2

The level of urinary iodine (UI) is often used as a biochemical indicator in the assessment of iodine deficiency. In this work, the use of flow injection technique for UI determination was studied. The determination was based on the catalytic effect of iodide in redox reaction between Ce(IV) and As(III). The reduction in yellow color of Ce(IV) is measured spectrophotometrically at 420 nm. The change in absorbance of Ce(IV) and after the reaction, which has taken place for a fixed time interval is related to the amount of iodide present in the reaction. For the analysis, urine samples and standards were digested with 28% w/v chloric acid.

This work presents the use of stop-FI mode as an alternative method of the continuous-FI developed by S. Muangkaew. The system was based on the above catalytic reaction. Optimum conditions such as mixing geometry, sample volume, 'go-stop' interval and 'stop-go' interval were investigated. Over the concentration range studied (0-200  $\mu\text{g/L}$ ), the signal was directly proportional to the iodide concentration. The detection limit was 2.3  $\mu\text{g/L}$ . Average total recovery was 99% (n=8). The method gave satisfactorily low % RSD (n=10) of 0.25%, although the operational procedure was carried out manually. Method comparison, performed on 11 samples, showed no significant difference between the results obtained from four methods (i.e. batch, stop-FI, continuous-FI and ICP-MS). The agreement suggests that the stop-FI method, developed in this work, can efficiently substitute the conventional batch, continuous-FI and ICP-MS methods.

Because the digestion step using chloric acid is difficult to perform and has problems related to environmental contamination, the necessity of sample treatment prior to analysis was re-examined. The kinetic profile of urine (without sample clean up) was studied in comparison with iodide standard. For convenience, the technique of stop-flow injection, stop-FI, was used for the kinetic studies. With this mode of FI, kinetic study was performed to a) confirm the order of the reaction, b) determine the rate constant and c) study the interferent effects. The results confirmed that sample treatment is necessary in determination of UI when the redox reaction between Ce(IV) and As(III) is employed.

FI methods incorporating gas diffusion or dialysis (microfiltration) were tested for on-line sample treatment instead of acid digestion. However, it was found that it was not possible to use these types of treatment in the FI approach, especially under the condition used. Therefore, digestion with chloric acid must still be used to inactivate a variety of interfering substances in urine.