

Thesis Title                      Development of Flow Injection Analysis  
   Procedures for Determining Copper Iron  
   and Zinc in Water

Author                              Mr.Winai Oungpipat

M.S.                                Chemistry

Examining Committee :

Assist.Prof.Dr.Saisunee	Liawruangrath	Chairman
Assoc.Prof.Dr.Kate	Grudpan	Member
Assoc.Prof.Dr.Boonsom	Liawruangrath	Member

### **ABSTRACT**

The main objectives of this research work were the development of analytical procedures and the construction of low cost FIA systems from readily available materials and instruments for the determinations of copper, iron and zinc. Three different spectrophotometric procedures adaptable for FIA were subsequently modified. Firstly, the FIA-colorimetry technique based on the reaction between copper cation and a colorimetric reagent, namely : 4-(2-pyridylazo) resorcinol (PAR) as carrier reagent in tri-sodium citrate adjusted to pH 2, was developed for the determination of copper. The product obtained after a 100 uL injection of copper(II) standard solution was a red complex for

which the absorption was measured at 512 nm. Optimal experimental conditions for determining small amounts of copper (II) were investigated and a linear calibration curve established linear over the range of 0.50-15.00 ppm. The technique was found to be reproducible, accurate and sensitive. The relative standard deviations for replicate injections were found to be 0.85 % and 0.76 % for 3 and 7 ppm of copper standard solution respectively. A detection limit of 0.01 ppm and percentage recovery of 99.81 were obtained. The recommended procedure was applied to the determination of copper(II) in water samples and was found to be in the range of N.D.-0.017 ppm. Secondly, an FIA-spectrophotometric procedure for the determination of iron(III) was developed. The method was based on the absorption at 350 nm of Fe(III) in a carbonate buffer carrier stream. Optimization of the parameters involved in the experiments was carried out for calibration of the FIA system, which showed linearity for iron(III) in the range of 0.50-15.00 ppm for 300  $\mu$ L sample injection. Relative standard deviations of 0.98 % and 0.97 % for replicate injections of 4 and 8 ppm respectively of iron(III) standard solution were obtained and a detection limit of 0.10 ppm was achieved. Finally, FIA- turbidimetry was applied to zinc determination in which the zinc forms a white precipitate of  $(C_{24}H_{26}N_4O_2)_2H_2[Zn(SCN)_4]$  with diantipyrylmethylmethane chloride in the presence of thiocyanate ion in acid solution.

Subsequently, the light transmission of the turbidity produced at 370 nm was measured. Optimization of experimental parameters was again investigated. The method exhibited good analytical characteristics. A linear calibration curve over the range 0.2-1.0 ppm of zinc ion could be achieved. The relative standard deviations from the means were 3.76, 0.95 and 0.24 % for determining 0.2, 0.5 and 0.8 ppm of Zn(II) respectively with a detection limit of 0.1 ppm of zinc. The recommended method was applied to the determination of zinc in water samples and found to be in the range 9.0-115.2 ppb.