Thesis Development of a Flow Injection Analysis Procedure for Copper Determination

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M.S. Chemistry

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ABSTRACT

A flow injection analysis (FIA) system was constructed from easily availible materials and instruments for copper determination in which the colorimetric procedure was modified for FIA to improve the efficiency of the method. Two colorimetric reagents for copper(II) were studied, namely diethanoldithiocarbamate and a synthetic reagent, 3-ethyl-5-hydroxy-5-D-arabinotetrahydroxybutyl-3-thazolidine-2-thione (EHTTT). The first method involved the measurement of the maximum absorption at 395 nm after 200 µl of copper(II) solution were injected into a carrier stream containing 0.10 % w/v

diethanolamine, 0.08 % v/v carbon disulfide and 0.08 M EDTA ; the pH was adjusted to 8.0. Optimum conditions for determining small amounts of copper in standard solutions were investigated and a rectilinear calibration curve established over the range of 0.5-4.0 ppm copper(II). The method has been applied to the determination of copper(II) contents in water samples collected from the Mae Ping River ; these contents were found to be in the range N.D. - 0.017 ppm. The other method was based on the reaction between copper(II) and the reagent developed in this research referred to as EHTTT, resulting in a yellow solution. Maximum absorption measurements were made at 430 nm. Again, the above colorimetric procedure was adapted for determining copper(II) in which 200 µl of copper(II) solution were injected into a carrier stream containing 0.010 % w/v EHTTT, 0.05 M acetate buffer and adjusted to pH 4.5. The optimum conditions of this method were investigated and a linear calibration curve over the range of 0.1-0.8 ppm of copper(II) was established. The method was highly sensitive with a detection limit of 0.001 ppm copper(II). The recommended procedure has also been applied to the determination of copper(II) contents in the water samples which were found to be in the range 0.005-0.018 ppm.