
Novel indirect spectrophotometric method for the determination of trace copper using methylene blue as a chromogenic agent

T.M.D.S. Thennakoon, H.H. Priyasiri, C.S. Gangabaddage*

Department of Chemistry, University of Ruhuna, Wellamadama, Matara, Sri Lanka.

Copper plays an important role in plants and animals as an essential trace element. However, high concentrations of Cu(II) is toxic, which causes health problems for human and has large influence on the growth of plants. In addition, copper is a potent environmental pollutant as it is a heavy metal. Therefore, it is a necessity to develop a rapid, sensitive, and cost-effective method for the determination of trace levels of copper. This abstract presents a novel, inexpensive, and suitable method for the determination of trace copper in industrial and environmental samples. UV-visible spectrophotometry is a convenient and reliable method, which has been used for the determination of many elements in trace quantities using several chromogenic agents. In this research, we develop a simple, rapid, and relatively-sensitive spectrophotometric method for the quantitative determination of trace levels of copper using methylene blue as a chromogenic agent. This method involves a reaction of Cu(II) with potassium iodide in acidic medium. It liberates iodine and consequently the liberated iodine bleaches the blue colour of methylene blue. Then the absorbance of remaining colour was measured using a UV-visible spectrophotometer at the wavelength of 665.6 nm. The decrease in absorbance of methylene blue is directly proportional to the concentration of Cu(II). The measurable range was found as 2.0-10.0 $\mu\text{g ml}^{-1}$ of the concentration of Cu(II). The results obtained using the novel method were verified with the standard flame atomic absorption spectroscopic method. In addition, the reaction conditions such as pH, buffer concentration were optimized and effects of diverse ions were tested.

Key words: Trace copper, chromogenic agents, Methylene blue, UV-visible method

*chinthaka@chem.ruh.ac.lk