Abstract

Single drop micro extraction (SDME) in combination with electrothermal atomic absorption spectrometry has been used to preconcentrate and determine thallium (III) ions followed by speciation of thallium (I) and (III). 10.0 ml of aqueous sample of thallium containing 0.5 ml of 1% picric acid as a counter ion at pH= 6 was extracted into a 4 µl microdrop of nitrobenzene containing dyciclohexano-18- crown-6 as complexing agent. After the extraction, the microdrop was injected into a graphic furnace for thallium determination. Different parameters affecting the extraction efficiency such as the type organic solvent, concentration of picric acid and crown ether, volumes of organic and aqueous phases, pH, extraction time and temperature were optimized. The effects of different interfering ions and methods of their eliminations were conducted. Under the optimized conditions, thallium (III) was determined with detection limit of 1.1 ng ml^{-1} and sensitivity of 0.3 ng ml^{-1}. Relative standard deviation for five replicate analysis of 10 ng ml^{-1} of thallium (III) was 4.2 percent. The calibration curve was linear in the range of 1.1-32 ng ml^{-1} of thallium. The enrichment factor was calculated to be 80. Thallium (I) and (III) speciation has been performed on the basis that thallium (III) forms a stable complex with EDTA and would not enter into the micro drop and hence only thallium (I) can be determined. The accuracy and validity of the method was evaluated using real samples of nail and spiked tap water and also certified reference material.

Keywords: thallium, single drop micro extraction, electrothermal atomic absorption spectrometry, crown ether (Dicyclohexano–18– crown– 6), picric acid.