Development of a Dispersive Liquid–liquid Microextraction Method for Fiber Optic linear Array Detection Spectrophotometry of Cobalt in Milk Samples

Hayati Filik, Derya Giray and Gamze Çetintaş
Istanbul University, Faculty of Engineering, Department of Chemistry, 34320 Avcılar Istanbul, Turkey

The low concentration of many analytes in samples makes it difficult to direct measurement. Therefore, the application of determination technique coupled with a separation/ preconcentration technique is necessary for trace analysis. A new trend in analytical chemistry is miniaturization of preconcentration systems with the aim of minimizing reagent consumption and waste generation. The fiber optic-linear array detection spectrometers (FO-LADS) including CCD-detector have made a major impact on simultaneous and real time data collection in analytical spectroscopy from UV to NIR. The use of fiber optics as light guidance allows a great modularity and flexibility in setting up an optical measurement system. In addition, optical fibers have high light focalization making them suitable for spectroscopic applications. Dispersive liquid–liquid microextraction (DLLME) has been used for the preconcentration of Co(II), after formation of a complex with 2-(5-bromo-2pyridylazo)-5-diethylaminophenol (Br-PADAP) and subsequent analysis by fiber optic-linear array detection spectrophotometry (FO-LADS) using a small amount of chloroform as the extraction solvent. This combination was carried out using cylindrical micro cell. Complex formation and extraction are usually affected by certain parameters, such as the type and volume of the extraction and disperser solvents, salt effect, pH, and the concentration of chelating agent, which have been optimised for the presented method. The linear working range was 0.2–50 µg L⁻¹, preconcentration factor 200 (from 10 mL of water sample), limit of detection (LOD) 0.1 µg L⁻¹, and relative standard deviation (RSD, n=5) 3.4 % (for 10 µg L⁻¹ of Co). The method was successfully applied to the determination of trace amounts of Co(II) in different milk samples.