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Speciation of inorganic arsenic(III) and arsenic(V) by a facile dual-cloud point extraction coupled with inductively plasma-optical emission spectrometry

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Abstract

A simple and efficient method using dual-cloud point extraction (dual-CPE) coupled with inductively coupled plasma-optical emission spectrometry (ICP-OES) was developed for the speciation of inorganic arsenic [As(III) and As(V)]. In first step of dual-CPE, As(III) formed a hydrophobic complex with ammonium pyrrolidine dithiocarbamate (As-APDC), and was subsequently entrapped by the Triton X-114 surfactant-rich phase at pH 5.0, whereas As(V) remained in the bulk supernatant. The surfactant-rich phase containing the As(III)-APDC complex was treated with a 2.0 mol L^{-1} of nitric acid, and As(III) was back extracted into the aqueous phase at the second cloud point extraction stage before ICP-OES detection. The As(V) concentration was calculated by subtracting the concentration of As(III) from the total inorganic arsenic concentration after reducing As(V) to As(III) by thiourea. Different factors affecting the extraction of As(III) were investigated in detail. Under the optimum conditions, the detection limit for As(III) was 0.72 ng mL^{-1} along with the relative