SPECIATION OF CHROMIUM BY PRE-CONCENTRATION METHODS. A NOVEL APPROACH

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Simple robust and novel analytical procedures were developed for chemical speciation of chromium by carrier element co-precipitation (CECP) and dispersive liquid-liquid microextraction (DLLME) by microsample injection system coupled with flame atomic absorption spectrophotometry (MIS-FAAS). Ammonium pyrrolidine dithiocarbamate (APDC), carbon tetrachloride and ethanol were used as chelating agent, extraction solvent and disperser solvent, respectively for the determination of Cr(VI). For total chromium, Cr(III) was oxidized by Ce(SO4)2 in acidic media (0.07 M H2SO4) and resulted solution formed co-precipitates with APDC in the presence of Ce(III). The Cr(III) was estimated by the difference of total Cr and Cr(VI).

The effective parameters of developed methods have been optimized and studied in detail. The limits of detection and enrichment factor of DLLME and CECP were [0.037 and 2.13 µg L−1] and [400 and 100], respectively with 40 mL initial volumes. The relative standard deviations (RSD, n = 6) were < 3.0%. The applicability and the accuracy of DLLME were estimated the analysis of Cr(VI) in industrial effluent wastewater by standard addition method (recoveries > 98.0%). The accuracy of total Cr by CECP after microwave acid digestion was checked by using certified reference materials (GBW 07309 Stream Sediment). Difference between found value and certified value is not significant (p > 0.05). The proposed method was successfully applied to the chromium speciation at ultra-trace levels in natural drinking water and industrial effluents of Denizli.

Keywords: DLLME, CECP, chromium speciation, drinking water, industrial effluent