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Original Research Article

## Optimization of vortex-assisted ionic liquid dispersive liquid–liquid microextraction by experimental design prior to hydride generation atomic absorption spectrometry for determination of selenium species in food, beverage and water samples

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## ABSTRACT

We applied novel vortex-assisted ionic liquid dispersive liquid-liquid microextraction (VA-IL-DLLME) method to preconcentration and extraction of Se(IV) ions from water, beverage and food samples. The method was optimized using central composite design combined with the response surface analysis. After extraction, inorganic selenium species (total Se, Se(IV) and Se(VI)) were determined by hydride generation atomic absorption spectrometry. 1-*n*-Octyl-3-methylimidazolium bis(trifluoromethane)-sulfonamide [C8mim NTf2] and tetrahydrofuran were used as the extraction and dispersive solvents, respectively. Applied vortex assisted the extractant dispersion and accelerated the mass transfer process. Obtained optimum conditions for microextraction procedure are as follows: mass of [C8mim NTf2], pH, extraction time and THF volume should be equal to 85 mg, 6.8, 15 min and 730  $\mu$ L, respectively. Under these conditions, we observed linear range, limit of detection and enrichment factor equal to 5–500 ng L<sup>-1</sup>, 1.5 ng L<sup>-1</sup> and 120, respectively. We also found linear regression coefficients in the dependence between Absorbance and Se(IV) concentration: Absorbance = 0.0652 C<sub>Se(IV)</sub> + 0.0185. We added 200  $\mu$ g kg<sup>-1</sup> of Se(IV) to selected food samples and 100 ng L<sup>-1</sup> of Se(IV) to selected waters and beverages. Relative standard deviations and recovery values were within the ranges of 2.4–3.5 % and 92.7–103.4 %, respectively. The optimized VA-IL-DLLME method reported here provides high extraction efficiency, fast extraction and lower detection limit without a heating step than alternative microextraction methods. This method also requires environmental solvents for determination and preconcentration of trace Se species in the selected samples. In addition, the reported VA-IL-DLLME procedure is the first method which use [C8mim NTf2] as extraction solvent for the preconcentration and separation of Se(IV) ions.