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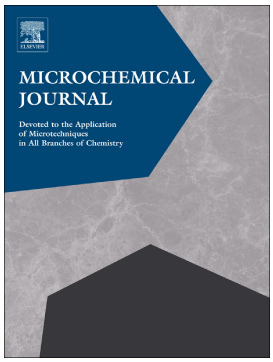

Development of preconcentration process of iron by using graphene adsorbent and experimental design methodology

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Abstract

In this study, a new method using graphene as an adsorbent was developed for the preconcentraion of iron prior to its determination by flame atomic absorption spectroscopy. Graphene produced via electrochemical exfoliation showed great promise as an adsorbent for preconcentration of iron from environmental water samples due to its large surface area. The adsorbent was characterized by using Raman spectroscopy and scanning electron microscope (SEM). Preconcentration conditions of iron were investigated by using solid phase extraction method that graphene was packed in the extraction column. The pH, flow rate and eluent concentration parameters affecting the recovery yield were optimized using a three factor, three-level Box-Behnken experimental design combining with response surface methodology (RSM). The optimum conditions were determined as pH 7.0, sample flow rate 3 mL min^{-1}, and eluent concentration 2 mol L^{-1}. The detection limit (LOD) was 0.36 µg L^{-1} and the relative standart deviation (RSD) was % 1.79. Finally, the proposed method was successfully applied to the analysis of environmental water samples and its accuracy was evaluated by the analysis of certified reference material. The analysis of variance (ANOVA) was applied in the Box-Behnken experimental design and the statistic data showed adequate models.

Key word: Iron, preconcentration, experimental design, graphene, solid phase extraction