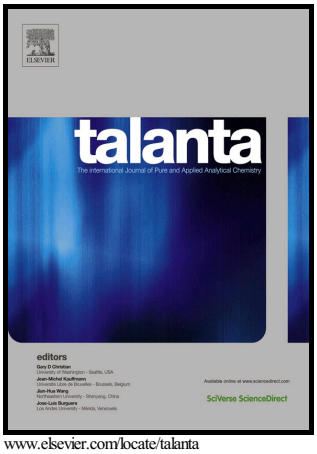

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Novel Hybrid Flow Platform for On-line Simultaneous Dynamic Fractionation and Evaluation of Mercury Lability in Environmental Solids

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ABSTRACT

A method for the automatic simultaneous assessment of mobility and lability of mercury in environmental solid samples has been developed for the first time. It has been implemented in a hybrid flow system integrating flow-through dynamic sequential extraction and on-line chemical digestion prior to atomic fluorescence detection. The method allows the determination of trace concentrations of labile mercury (Hg_L) and non-labile mercury (Hg_{NL}) in different bioaccessible phases of environmental solid samples thus providing expeditious data not only for Hg exposome studies but also for the selection of suitable environmental remediation techniques. The analytical procedure involves the sequential application of deionized water, 0.01 M HNO_3 solution, 1 M KOH solution and solution containing both Na_2S and KOH (1 mol L^{-1} each) to a solid sample packed in a column to release four Hg fractions according to their mobilities (i.e. water soluble, exchangeable, organic matter associated, and sulfide bound Hg) followed by the on-line determination of the concentrations of Hg_L and Hg_{NL} by flow programming. Apart from obtaining more comprehensive knowledge of risk exposure of Hg-laden solids, important advantages of the newly developed method compared to its batch-wise fractionation counterpart include (i) approximately 8-fold reduction in the time for acquisition of the dynamic extraction data, (ii) evaluation of the kinetics of release of Hg, (iii) Hg lability analysis, and (iv) minimization of matrix interferences and potential re-adsorption or transformation of the extracted Hg species.