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Rapid determination of Pb isotopes in water by coupling DGT passive samplers and MC-ICP-MS laser ablation

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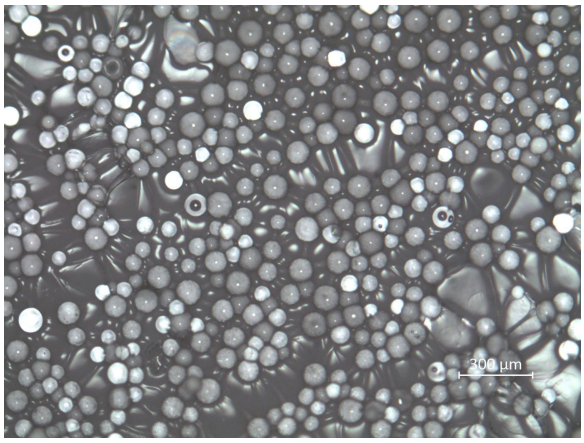

Despite a considerable reduction in the amount of lead (Pb) in the environment as a result of control measures and policies, environmental Pb exposure remains a major public-health issue. Using Pb isotopes is a powerful tool for tracking metal pollution in the environment, especially in natural water where it can have negative health effects even at low concentrations. In this study, we developed a new method of coupling a commercially available chelex 100-DGT passive sampler (Fig. 1) and MC-ICP-MS laser ablation for measuring Pb isotope compositions in natural water[1]. This coupling offers several advantages: (1) The DGT device gives an isotopic composition of natural water integrated over time and pre-concentrates metals *in situ*. (2) Laser ablation allows a direct analysis of DGT without chemical preparation, reducing preparation time and the risk of contamination. We used a low fluence for linear ablation of squares with 150 µm sides, achieving optimal sensitivity without burning the sample. A good compromise between pulse-repetition rate (Hz) and scan speed (µm/s) is necessary for obtaining good sensitivity with similar intensity on both standard and sample, while maintaining a low background level. For an accurate analysis of the Pb isotope composition of DGT by LA-ICP-MS a matrix-matched calibration is necessary, which was easily produced by immersing DGT in a standard solution. Finally, a water-flow experiment in a system simulating a piezometer demonstrated that it possible to analyse Pb isotope compositions in water by DGT and MC-ICP-MS laser ablation with sufficient precision (0.09% for $^{207}Pb/^{206}Pb$) for distinguishing various anthropogenic Pb sources in the Environment. This method offers new perspectives for public policy development as it facilitates isotopic monitoring of natural water, better to combat Pb pollution.

Fig. 1 Optical image of DGT resin layer.

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