Towards practical applications of measurements of labile chemicals in the environment based on a novel passive sampling technique

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Abstract

The recent development of a passive sampling technology of diffusive gradients in thin films (DGT) is moving towards practical applications in measurements of liable/bioavailable chemicals in soils, waters, and sediments. This presentation provides a summary of the theory and development of a novel DGT variant using Zr-oxide based binding gels. The Zr-oxide DGT was developed in 2010. It has relatively high capacity for measurements of oxyanions (P, As, Cr, Se, Sb, Mo and W), with 50 and 5_˜29 times of those of the commonly used ferrihydrite DGT for measurements of P and As, respectively. It is easy to provide high-resolution (sub-millimetre), two-dimensional spatial information of P using a gel coloration procedure, while this technique has been successfully applied to in situ monitoring labile P in a large eutrophic Lake Taihu in China. Simultaneous measurements of cations and anions, such as P and S, P and Fe, As and Fe, and As, Fe and P, as well as multiple elements of P, As, Cr, Mo, Sb, Se, V, and W, have been successfully achieved through development of several types of mixed binding gels based on the Zr-oxide gel. The application of this technique is also effective to investigate the mechanisms of eutrophication in lakes, by providing high-resolution evidence for iron-coupled mobilization of phosphorus in sediments. Meanwhile, improvements have been made to modify the design of the DGT probes including a dual-mode holder and a new flat-type holder for easier practical applications in water/soils and sediments, respectively.

Keywords: Passive sampling, Diffusive gradients in thin films (DGT), Zr oxide DGT, Bioavailability

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