Measurement of Silicon in Waters a nd Soils Using Diffusive Gradients in Thin Films

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Silicon (Si) plays important role in aquatic and terrestial ecosystems and is involved in many vital environmental problems like carbon cycling, climate change and aquatic eutrophication. Dissoved Si (DSi) is the main form of Si in water and soil and there is no effective method to measure it. In the present study, we adopted diffusive gradent in thin films (DGT) to measure DSi which has been widely used to measure bioavailable concentration of nutrients and heavy metals. A novel DGT binding layer of precipitation zirconia has been developed and the performance of this precipitated zirconia (PZ) for measuring Dsi in both in laboratory and field settings have been investigated for the first time. Results found that PZ had great capacity to adsorb Dsi and achieved the maximum after 90 min. The pH from 4 to 8 had no significant influence on the measurement of DSi in solution ($DGT_{Si}/Solution_{Si}$=1.0±0.1), which lies in the acceptable limits. Ion strength from 0.1 mmol/L to 1 mmol/L had the same impact on the measurement to pH. Therefore, PZ DGT can be used for DSi in real environment. PZ DGT had been deployed in different soils and rivers and obtained reliable results. Therefore, the establised DSi measurement with PZ DGT can effectively measure DSi in both soil and water.