Migration and Distribution of Cadmium in Aquatic Environment: The Role of Natural Biofilms and Surficial Sediments

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For better understanding of the migration of trace metals in aquatic environment, processes of Cd reaching quasi-equilibrium among different phases, including water, natural biofilms and sediments, were investigated, using microcosmic simulating systems. The re-equilibrium of Cd after a supplement of Cd and after an adjustment of pH were also investigated. The results showed both the migration of Cd from water to the solids, and the accumulation of Cd in the solids. (Modified) pseudo-second-order kinetic model can be used to simulate such processes. Cd content in biofilms and sediments varied in different ways: Cd in biofilms increased rapidly at first, then decreased, and finally approached constancy, while Cd in sediments increased slowly and continuously (Fig. 1). The more the Cd was added, the higher the Cd contents in solids, and the quicker the Cd accumulation and decrease process would be. The decrease of solution pH promoted the release of adsorbed Cd, especially from biofilms, while the increase of pH stimulated the migration of Cd to the solids. As an indicator and temporary reservoir of trace metals in water, which respond rapidly to the variation of trace metal concentration in water, biofilms play a role in indicating and buffering the variation of trace metals in water. Although the response of sediments to the variation of metal concentration in water is very slow, most trace metals migrate to sediments eventually, thus sediments play a role as a more stable and massive reservoir for trace metals in water.

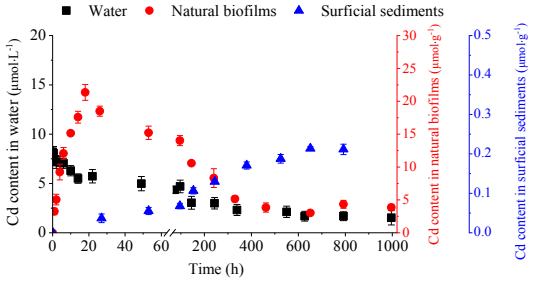

Figure 1: Cd contents in different phases in the first stage of the experiment.