Sediment Geochemisty of Quaternary Aquifers in Jianghan Plain, Central China: Implication of Arsenic Occurrences and Mobilization

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Understanding the mechanism of arsenic mobilization from sediments to groundwater is important for drinking water supply and water quality management in endemic arsenicosis areas, such as the Jianghan alluvial plain in the middle reaches of the Yangtze river, central China. Sediment samples from three boreholes with depths up to 230m in typical arsenic-affected area were collected for bulk geochemistry analysis and As, Fe and S speciation.

According to the lithology and grain size analysis, the Quaternary aquifers could be divided into the Holocene-upper Pleistocene phreatic aquifer (15-60m) and middle-lower Pleistocene confined aquifer (>60m). Bulk sediment geochemistry analysis showed that The As, Fe, Mn, P, TOC contents in the sediments of middle-lower Pleistocene aquifer were much higher than those in the Holocene and upper Pleistocene aquifer. Arsenic sequential extraction and SEM-EDS analysis indicated that the shallow sediments possessed an average As content of 9μg/g, which was mainly associated with reducible iron-oxides, and the As content in the groundwater was up to 2330 μg/L. The deep aquifer possessed an average As content of 55μg/g, which was mainly associated with As bearing pyrite and sulfides, and the highest As content in the groundwater was about 100 μg/L.

Iron sequential extraction results indicated Fe mainly existed as iron-oxides in Holocene and upper Pleistocene sediments, while the siderite was the main form of in middle-lower Pleistocene sediments. In addition, abundant Fe in pyrite-form were observed in some sulfur riched samples in middle-lower Pleistocene sediments. These results could provide insights into the arsenic mobilization mechanism in multi-layers aquifer system and assurance measures for rural safe drinking water supply in Jianghan Plain.