

Transportation process of As in surface and shallow ground waters

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Natural As contaminated groundwater has been a serious problem in the world. Instead of numerous studies, sources and pollution mechanism are still in debate. Most accepted source of As is Fe-oxyhydroxides that adsorb the As, and reduction-dissolution of the Fe-oxyhydroxides is believed to release the As into groundwater. Biotite and pyrite would be candidate sources of As, however, few studies assured the presence of As in those minerals. Here, transportation process of the As in surface water and As release mechanism in shallow sediments.

Arsenic is transported as dissolved components and suspended matters. Total As concentration of Red River water is ~10 ppb, and dissolved As and As with suspended particles are 6:4. Although the Red River water contained gibbsite and goethite as suspended matters, those do not but clay minerals host the As as adsorbent. Concentrations of As of the riverbed sediments of Ganges-Bramaptra and Red Rivers are a few to 15 ppm, most of which are in insoluble detrital phases such as silicates and sulfides. Chlorite was the host phase of As in As contaminated groundwater aquifer in our study areas of Bangladesh and Pakistan, although different detrital minerals can host As in each rivers, of which tributaries As contaminated groundwater occurs. These results suggest that the transportation of As with detrital minerals is more important than that as dissolved components and adsorbed phases onto clay minerals and goethite.

In the shallow sediments, As concentration changes with redox potential and pH. Geochemical condition would be controlled by microbial activity in the aquifer. Dissolution of As occurs at the depths where detrital As host minerals are decomposed via oxidation. Newly formed Fe-oxyhydroxides would adsorb parts of the As but not all. Thus, the dissolution of As host minerals are the main reaction to cause As contaminated groundwater.

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