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Reactivity of organic matter in mobilizing arsenic from aquifers of the Hetao basin, Inner Mongolia

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High arsenic (As) groundwater has been found in the shallow groundwaters in the flat plain of the Hetao basin, which is patchily distributed. Little is known about linkage of reactivity of organic matter to As mobility in groundwaters. Both groundwater and sediments were sampled from shallow aquifers in a perennial wetland area (PL) and a dried wetland area (DL). Higher dissolved As concentrations were observed in PL than DL, although sediments had identical As contents in aquifer sediments. In both areas, dissolved As increased with increasing sampling depths. Water H and O isotopes supported evident recharges of surface water into aquifers in the PL. Although organic matter contents in sediments from DL (averagely 3.03 mg/g) were generally higher than from PL (1.89 mg/g), relatively higher SUV_{254}, as an indicator of the humic fraction of organic matter, were observed in water soluble organic matter (WSOM) from DL sediments (4.61 L/mg·m) than from PL sediments (averagely 2.18 L/mg·m). The fluorescence source index (FI) was also calculated to provide information about the organic matter sources. Average FI of WSOM from DL sediments was identical to that from PL sediments (around 1.6), indicating the origin of microbial organic matter. Humic-like fluorescence, tryptophan-like fluorescence, and humic-like fluorophore were recognized by the parallel factor analysis (PARAFAC) of three dimensional fluorescence excitation emission matrices (EEMs) of organic matter. Humic-like fluorescence of WSOM were generally lower in PL sediments than those in DL sediments. However, relatively higher tryptophan-like fluorescence were observed in WSOM from PL sediments than those from DL sediments, indicating more biodegradable WSOM in PL sediments. In PL area, water soluble organic matter is potential labile and important for triggerring reductive dissolution of Fe(III) oxide minerals. Therefore, the higher arsenic concentration in PL would attribute to higher reactivity of organic matter in aquifers. The optical properties of dissolved organic matter merits further investigation.