Arsenic Contamination in Groundwater and its Sorption in the Natural Aquifer Material; South-Western Bangladesh

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Occurrence of Arsenic (As) in an elevated concentration in ground-water (GW) has predominantly been regarded as a serious environmental concern in the upper shallow alluvial aquifers in South-Western Bangladesh, over the years. This paper intends to unveil the dominant geochemical processes that drive the As mobilization with a view to pointing up mainly the potentiality of its sorption by the natural aquifer materials.

Spectroscopic study such as bulk mineralogical analysis by XRD, elemental analysis by XRF, and elemental mapping by SEM and TEM strongly support the wide-spread presence of the adsorbent minerals like iron oxy-hydroxide in the aquifer sediments.

A parametric partition coefficient K_d model ($R^2 = 0.69$) was derived from the solid-water interface parameters like GW-pH and the two other Gaussianised independent variables particularly logarithm of oxalic acid extractable Fe and Al contents of the contaminated sediments [1]. In addition to this K_d, the field based reaction rate K_r (2.72×10^{-16} mol/m^2/sec) obtained from inverse mass balance method was also incorporated into the 1-D finite difference code TRANSQ to predict the distribution of As in the sediment matrix.

Sorption potentiality of the aquifer sediment particularly, finer particle containing larger Iron oxyhydroxides was found to have much better adsorption capability (92%) than that having medium grains (72%) with relatively lower iron minerals. Numerical computation shows that after 80 years significant dissolved As from GW may gradually be removed by the natural absorption onto the oxidized sediments which may further be considered as the natural attenuation mechanism.

References

[1]   MT. Rahman, A. Mano, K. Udo and Y. Ishibashi, *Proc. AdGeo*, **HS-17** (2010).