A carbon nanotube-associated arsenic species in Mekong Delta sediments

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Arsenic (As) contamination in groundwater in Southeast Asian deltas is common and represents a significant health hazard [1]. Despite extensive research to reveal the mechanism of As release, from sediments to groundwater, its sources and sinks remain under debate.

Here, we investigate As speciation in redox-preserved sediment cores from the Mekong Delta in Vietnam. We characterize the sediments at a wide range of scales, including bulk mineralogical and chemical analyses, micro-scale electron microscopy and spectroscopy, and molecular scale X-ray absorption spectroscopy. We discovered a novel As species associated with carbon nanostructures. This species was identified throughout the sediment profile as well as in suspended particulate matter in the Mekong River. At some depths, the sediment also harbored arsenian pyrite and trivalent arsenic bound to organic-sulfur groups, corresponding to a paleo-mangrove depositional environment. We propose that the carbon nanostructures and the associated As species are transported by the river from upstream coal deposit, delivered to the sediment as part of the alluvium, and buried. This novel As species likely act as a long-term As source, as it is presumed to be more soluble than crystalline arsenian pyrite. The discovery of this As species brings novel insights to bear on the conceptual model of As sources and sinks in deltaic systems in Southeast Asia.

[1] Fendorf, et al. (2010). *Science* 328, 1123-1127