

Arsenic Removal from Water by Iron Sulphide Minerals and Sulphate Reducing Bacteria

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Arsenic pollution of water is a serious environmental problem, as exemplified by massive arsenic poisoning from groundwater in Bengal and arsenic pollution associated with careless management of mine waste in the Mediterranean.

Iron sulphide minerals, pyrite and pyrrhotite, have been quantitatively tested for their abilities to adsorb arsenic from solution. Both mineral powders ~300 mesh were added to As(III)- and As(V)-spiked waters. The results showed that 0.4g of pyrite or pyrrhotite fresh powders can rapidly reduce arsenic(V) or (III) from 10 ppm to the hardly detectable levels (<0.005 ppm) for 100 ml solution. Under oxidising conditions, the adsorbed arsenic will slowly be released back to the solution. Iron filings, however, can substantially reduce the rate of backward release. Sulphate reducing bacteria were cultivated in media containing ferrous sulphate, lactate and arsenate. 10 ppm As was reduced to 0.05 ppm in two weeks. In a simple culture with 10 ppm As(V), we found that about 90% of arsenic was removed by green algae.

In summary, there are simple, inexpensive methods for cleaning As-polluted water. The practical use of these will depend on the sources, scale and the nature of the reservoirs, surface or ground waters. But the materials used to remove the arsenic are toxic and must be managed with great care.