Immobilization of Arsenic by a thermoacidophilic mixed culture with pyrite as energy source

SILVIA VEGA[1*], JAN WEIJMA[1], AND CEES BUISMAN[2]

[1,2] Sub Department of Environmental Technology, Wageningen University, Wageningen, 6708WG, Netherlands (*correspondence: silvia.vegahernandez@wur.nl)

LOOKING FOR AN EFFICIENT ARSENIC STORAGE MEDIUM

Arsenic is an abundant element associated with a wide range of minerals and a major contaminant released to water during industrial operations. As Arsenic is no longer commercialized a safe disposal is needed. For this purpose, the preferred route for Arsenic immobilization is iron arsenate in the very stable mineral scorodite ($FeAsO_4{\cdot}2H_2O$). On demand of an environmentally secure and efficient disposal, we aim to remove arsenic trough Bioscorodite process. The latter is a combination of Biological oxidation and biocrystallisation and is mimic by the intrinsic ability of thermoacidophilic archaea to oxidize iron Fe(II) and carry out the oxidation of arsenite (As(III)) to arsenate (As(V)) under extremes conditions of acidity and elevated the temperature. In this process, we have investigated the role of a thermoacidophilic mixed culture in the oxidation of As(III) and precipitation of (As(V) in the form of Scorodite from a synthetic wastewater containing 6.7mM of As(III) and 0.5%Wt pyrite as the only iron Fe(II) source. The results indicate that As(III) was completely oxidized From the synthetic wastewater in presence of pyrite and Scorodite was formed only in presence of the mixed culture at a Fe/As:1.3.moreover, the addition of pyrite is accomplished to the process not only as the main energy source for the microorganisms but as catalyst in the As(III) oxidation reaction.