Future calamity of Arsenic poisoning in the groundwater of Thoubal and Bishnupur districts of Manipur (India)

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Above 10 μg/L (WHO 2001) concentration of arsenic in the drinking water lead to carcinogenic, cardiovascular disease, neurotoxicity and diabetes in the human. Arsenic poisoning in the groundwater is growing threat to a very large portion of Indian population. Along with the West Bengal, many areas of Uttar Pradesh, Jharkhand, Bihar, Chhattisgarh and Assam have been reported with higher concentrations of arsenic in the groundwater. To know the extent of arsenic poisoning in parts of Manipur a study has been carried out and 26 groundwater and samples were collected for analysis. More than 57% samples recorded arsenic > 10μg/L while this concentration in the surface waters samples is negligible. The highest concentration of arsenic (535 μg/L) was registered from Ngangkha Lawai Mamang Leikai area of Bishnupur district which is fifty fold of the (WHO 10 μg/L) limit for arsenic and tenfold of Indian permissible limit (50 μg/L).

In previous study the highest concentration of arsenic 200 μg/L[2] was reported in the same area of Bhishnupur district. Whereas in present study the highest concentration of arsenic is (535 μg/L) which is nearly three fold of previous study. This study shows that the arsenic concentration in groundwater is increasing with time. If situation continues, the groundwater may become higly pollutted with arsenic and may become a major cause of concern to the population of this region.

In this study the presence of arsenic free water on the surface and contaminated groundwater at subsurface levels indicates the existence and functioning of arsenic release mechanism within the aquifer sediments [3].

[1] WHO 2001.[2] Jayalakshmi *et al*. *(2010) Environ Earth Sci* **62**:1183–1195 [3] Farooq *et al*., (2012) *Applied Geochemistry*., **27**, 292-303.

Role of aggregates formed during process stabilization in a production of methane in biogas reactors

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To optimise the co-digestion of sewage sluge and rape seed oil a fast increase in the organic loading rate and the addition of CaO was tested in an experimental setup. The process stability was increased by aggregate formation. Theses aggregates were extracted and subjected to detailed characterization using SEM-EDS, XRD, FTIR and optical microscopy. The aim of this study is to describe the aggregates in terms of their morphology and mineral composition, as well as to find the answer about the role of microorganisms in their formation. The relationship between Calcium and organics components like long-chain fatty acids (LCFA), polysaccharides and proteins and microorganims was investigated to get a more detailed inside into biofilm formation that is known to favour syntropic acetate oxidation and methane formation.

The aggregates differed in size (from 0.5 mm up to 0.5 cm), shape (usually rounded) and porous inner structure (different pore size) and showed a bipartite structure. In each part organic material containing calcium was the main component (LCFA-Ca).

Adsorption effects as well as precipitation of insoluble salts of LCFA and Ca formed an outer cover of aggregates and offered interfaces within the aggregate as well. The aggregates formation was stimulated by CaO addition and had a positive impact on growths of synthrophic consortia. Due to the high concentrations of short-chain organic acids phosphate accumulating bacteria (PAO) took up acids like acetate and propionate and released phosphate which precipitated with cations present in the sludge. Iron and aluminium phosphates were more common than calcium phosphates. Therefore we assume that calcium added during experiments mainly precipiated with LCFA as a strengthening material for aggregates. It was noted that precipitation of LCFA decreased their toxicity and obviousloy, activity of PAO and syntrophic consortia increased the pH inside the aggreagates and created favourable conditions for methan production. Therefore, an stable biogas production was observed although the pH and the H_2 concentration in the liquid phase of the sludge were below optimum.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.11