IDENTIFICATION OF ARSENIC LEVELS IN SRI LANKAN GROUNDWATERS AND DEVELOPMENT OF LOW-COST ARSENIC REMOVAL METHODOLOGY

RMSC Ranasinghe and DRIB Werellagama
Department of Civil Engineering, Faculty of Engineering,
University of Peradeniya, Perdeniya

Arsenic, which is highly toxic to humans even at low concentrations is a dominant trace pollutant found in drinking water. Sri Lannkan standard (SLS 614,1983) for drinking water is 50 ppb whereas WHO and proposed USEPA standard are 10 ppb. Arsenic originates both from natural and anthropogenic sources. Acute short-term exposure to high doses of arsenic can cause adverse health effects. Most commonly reported symptoms of chronic arsenic exposure are conjunctivitis, melanosis, hyperkeratosis and some other skin lesions. In severe cases, gangrene in the limbs has also been observed.

In our region, Bangladesh is facing a severe pollution of drinking water due to arsenic. This arsenic derives from the geological strata underlying Bangladesh. The effect became dominant due to large drops in groundwater levels. Due to Farakka dam, on the river Gangas in India, groundwater level is being lowered markedly during the dry season in the Northwestern and Western regions of Bangladesh, exposing the dry sediment layer to oxidation. As a result, pyrites have been dissolved in groundwater releasing arsenic into drinking water supplies.

In Sri Lanka also groundwater consumption and construction of dams across rivers are increasing. Within the last twenty years many large dams were constructed. Therefore high drawdown of water table in downstream areas of these dams may lead to problems similar to Bangladesh since the geological aspects are similar (pyrites are found in calcipyres and graphite -bearing veins in Sri Lanka (Cooray, 1984)). Hence the problem may exist in Sri Lanka, though it is not reported yet. One reason for absence of such data is the lack of facilities to measure arsenic. Therefore in this research the basic data on arsenic levels and its spatial variation in aquifers in Sri Lanka are being obtained. To reliably analyze the arsenic level in water, a method based on the Hydride Generation -Atomic Adsorption Spectrometry (HG-AAS) is being developed at the Faculty of Engineering, University of Peradeniya.

Most of the available arsenic treatment technologies perform well at high cost. It is important to develop a low-cost treatment method for low-income countries. Presently SORAS method, introduced by a Switzerland-Bangladesh joint research group (Wegelin et al., 2000), is used at household level to treat drinking water. In this study a new low cost treatment method for arsenite, As (III) removal by sorption on laterite, has been researched. Laterite found abundantly in South-western Sri Lanka contains iron. Mainly As (III) will be studied due to its high toxicity, mobility and solubility than arsenate, As (V).

Also as a part of this study, the adsorption behaviour of arsenite on goethite was studied. When reviewing past studies it was found that many studies have been carried out on arsenate removal using goethite. There have been fewer experiments on arsenite removal. Almost 90% arsenite removal could be achieved using goethite and the high removal was observed within the natural pH range. This will lead to an efficient arsenite removal process from the natural water since no pH adjustment is needed.