NATURAL OCCURENCE OF ARSENIC IN DEEP WATER WELLS AND ITS REMOVAL USING A PILOT PLANT BASED ON LOW COST SOLAR COLLECTORS

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ABSTRACT

The arsenic concentrations and quality of water from 18 deep water wells (above 50 m) located in the west side peri-urban area of Cochabamba, Bolivia have been assessed, together with a study on the performance of a low cost solar collector based pilot plant applied to arsenic removal.

The analyzed water samples indicated a calcium-bicarbonate ($Ca\text{-}HCO_3$) water type. They are slightly alkaline, ranging from 7,4 to 8,3 with an average of 7,7. The redox sensitive ions, iron, (average 0,3 mg/L) and < 0,1 – 1,2 mg/L (average 0,4 mg/L), respectively. They are reductive (ORP in the range of -12,5 – 69 mV). Arsenic was determined in the same sampling sites and in two different periods (wet and dry seasons) Dissolved arsenic concentrations exceed Bolivian regulations and World Health Organization (WHO) guidelines (10 μg/L) for drinking water in approximately 50% of the wells. Moreover, nearly 40% of the wells exceeded those regulations more than ten times, in samples taken within the dry season (8 months). The performance of the pilot plant, which uses the Solar Oxidation and Removal of Arsenic (SORAS) technique, was satisfactory even in cloudy days, obtaining arsenic removals higher than 80% and As concentrations far below the Bolivian regulations. There exists a significant removal of arsenic (c.a. 75%) in the course from the water well to the entrance to the pilot plant. Such removal occurs due to the adsorption of arsenate ions on iron (III) and manganese (IV) oxides, attached to the surface of the distribution line, including pipes and storage tanks. Aeration with domestic commercial sprinklers can achieve an effective oxidation of arsenite ions to arsenates.

Keywords: Arsenic, Cochabamba, Solar Oxidation and Removal of Arsenic (SORAS)**.**