

ARSENIC CONTAMINATION OF SEDIMENTS AT KOUHSORKH AREA (NORTH_EAST IRAN)

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Table 1–Correlation matrix of elements in water resource.

	Al	As	B	Br	K	Li	Cl	Na	S	Sb	Si	Sn
Al	1											
As	0.365918	1										
B	0.391725	0.597222	1									
Br	0.093835	0.67074	0.492619	1								
K	0.032111	0.574742	0.094122	0.548221	1							
Li	0.581012	0.593083	0.092232	0.521722	0.97714	1						
Cl	0.474382	0.393333	0.421222	0.623111	0.444716	0.331134	1					
Na	0.097222	0.393333	0.092232	0.191933	0.092232	0.393333	0.393333	1				
S	0.097222	0.393333	0.092232	0.191933	0.092232	0.393333	0.393333	0.462222	1			
Sb	0.097222	0.393333	0.092232	0.191933	0.092232	0.393333	0.393333	0.462222	0.972222	1		
Si	0.097222	0.393333	0.092232	0.191933	0.092232	0.393333	0.393333	0.462222	0.972222	0.972222	1	
Sn	0.097222	0.393333	0.092232	0.191933	0.092232	0.393333	0.393333	0.462222	0.972222	0.972222	0.972222	1

INTRODUCTION

Arsenic contamination of drinking water is problematic in 42 countries in different parts of the world in all continents (Mukhrejee & et all 2006). Asian countries have the highest rate of arsenic pollution in drinking water. In Iran's neighbor countries contamination of Arsenic were reported specially from Pakistan, Afghanistan Turkey, and Azerbaijan and so on. Unfortunately only Kurdistan and Kuohsorkh regions of Iran have been introduced as the polluted area at the world scale. (Mosaferi & et all 2003, Parvaresh & et all 2008). But there are many unknown arsenic polluted zones in Iran which needs more attention. Furthermore, based on the mobilization mechanisms of arsenic in the environment, it has been predicted that the West Asia specially Iran and Turkey should be affected by arsenic pollution (Rovenscroft.p 2007).

MATERIALS AND METHODS

Kuohsorkh area is located at 35 km of North Kashmar, Khorasan province, NE Iran. Geological and petrological investigations show that the main rock formation in the area consists of Tertiary volcanic rocks with basaltic andesite to rhyodacite composition. In this area As-Sb mineralization occurred in acidic tuff predominantly as realgar and orpiment. Also polymetallic ore deposits exist at Kuohsorkh area and more than 2 hot springs was observed at this region.

Based on Chinese geochemical investigation (1996) on stream sediments at the area the concentration of arsenic was determined between 3 – 482 ppm. Chemical composition of 15 water samples from aqueducts and springs at some villages in Kuohsorkh area were measured by ICP-MS. The PH of water samples were determined between 7.5 - 8.98. The correlation matrix was calculated, this matrix shows a high positive correlation of As, Sb, Al, B, Li, S, Na, K and Cl (table1). Concentrations of As were detected to range between 10 – 650 ppb, exceeding EPA and WHO limits (Parvaresh 2008).

At this research detail chemical composition of 20 sediments samples was considered. The samples were collected from 20 cm depth; most of them belong to the stream and spring sediments at the area with high content of arsenic in water. Then sediments with less than 180 micrometer size were analyzed by ICP-MS.

The results show the concentration of arsenic between 4.2 to 268.2 ppm in the sediments. Arsenic has a positive regression with the Sb, Ca, B, Li and S elements. But As have a negative regression with other elements such as Fe, Cr, Co, Ni, Zn, Mg and P (figure1).

Permissible limits of As in soil and sediment vary from 0.39 mg/kg for residential soil to 1.6 mg/kg for industrial soil with direct contact exposure (US EPA 2004). Since concentration of arsenic in the sediments at Kuohsorkh area is higher than permissible limits, so these sediments are polluted to arsenic.

Mineralogy of bulk sediment with the help of XRD was determined that quartz and calcite are the main minerals, albite, muscovite, montmorionite; hematite and gypsum are the subordinate minerals. Magnetite and hematite was observed under reflected microscope with less than 1 volume percent. But observation the sediments less than 180 micrometer size under reflected microscope has detected more magnetite and hematite. Also some grains of arsenopyrite and pyrite were appeared.

Medical consideration in some villages with high content of arsenic in water and sediment was revealed special arsenic related diseases. People at this residential area are suffered from skin diseases including: deeply skin fissure and herpes. Detailed medical geology investigation at the area is under investigation.