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DETERMINATION OF MERCURY IN WATER AND SEDIMENT FROM QARMAT – ALI AND PAPER FACTORY ALONG SHATT AL-ARAB RIVER

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Abstract

The determination of mercury achieved by means of Cold Hg Vapor Atomic Absorption (CVAAS) was determined in the water and sediment samples from 7 locations at Qarmat –Ali and paper factory along shatt Al-Arab river during 2006 ,also some physical and chemical parameters were obtained during this study. The results showed low Hg content of water at station (2) (0.06 µg/ml), whereas high content of Hg has been found (0.083 µg/ml) at station (1). Another hand the lower conc. of mercury in the sediment samples recorded at station (3)(0.32 µg/g) and higher conc. observed at station (5)(0.39 µg/g). The main source of Hg in the discharge of paper factory is expected from electric cells of chlorine unit. The result also shown that conc. of mercury in sediment higher than in the water samples; This is the first study carried out in this region, and could serve as a baseline in this important area.

الخلاصة:

تم في هذا البحث تقدير كمية الزئبق في مياة ورواسب نهري كرمة علي وشط العرب في المنطقة القريبة من شركة الصناعات الورقية في البصرة ونقطة تصريفها وذلك بأستخدام جهاز الطيف الامتصاصي الذري نوع Shimadzo.AA630-12 . أختيرت في هذة الدراسة سبعة محطات أخذت منها عينات الماء والرواسب واظهرت النتائج التي أجريت خلال عام 2006 بأن اوطأ تركيز للزئبق لعينات الماء كان عند المحطة (2) (0.06 µg/ml) وأعلى تركيز عند المحطة (1) (0.083 µg/ml) ولعينات الرواسب كان أوطأ تركيز عند المحطة (3) (0. 32 µg/g) وأعلى تركيز كان عند المحطة (5) (0. 39 µg/g) . يعزى سبب زيادة تركيز أيونات الزئبق في الرواسب عنها في الماء لعملية التراكم التي تحدث. تعتبر الخلايا الكهربائية لوحدة الكلور في الشركة العامة للصناعات الورقية من المصادر الرئيسية للتلوث بألزئبق. تمت مقارنة النتائج التي حصل عليها مع نتائج دراسات سابقة.

Introduction

Mercury is found in many natural sources such as coal. Thus, it is a part of the emissions from coal-burning power plants, but combustion of almost any material as in waste incinerators is apt to release elemental mercury to the atmosphere where it is distributed globally. On return to the earth, in aquatic environments it is converted to inorganic mercury. and this can be converted to organic forms by microorganisms.All forms of mercury are toxic, but it is a chameleon among poisons. As pointed out in the story the inorganic salts produce very different syndromes depending on whether the exposure is due to a single large dose (acute), or multiple small doses (chronic). Neither of these clinical pictures is quite like methyl mercury poisoning. Liquid elemental mercury is also a horse of a different color. It is sufficiently volatile, that poisonings most commonly occur as a result of inhalation of the vapors. It is not absorbed from the gastrointestinal tract. The signs referable to mercury vapor exposure are initially those of central nervous system involvement with late kidney damage. Disturbed individuals have injected themselves intravenously with liquid mercury. If one survives the acute insult, which may result in a fatal pulmonary embolism, lung X-rays show a bizarre distribution of small opaque bodies, as if the patient had been shot gunned. Today, mercury thermometers and other laboratory apparatus that used the liquid form have largely been replaced with alternatives (1). Mercury pollution is a global environmental problem. Mercury is emitted to the atmosphere from natural sources, such as from volcanic eruptions, forest fires, biogenic

emissions, degassing from water surface and wind entrainment of dust particles (2). Anthropogenic emissions of Hg are mostly from coal combustion, municipal and medial waste incineration , smelting and other industrial activities (3) . The toxicity Of inorganic Hg forms is at least in part explained by the elements great affinity for biomolecules containing sulfhydryl (SH) groups (4) . and by a lower affinity for phosphate, carboxyl , amide and amine groups (5) . Mercury can create harmful effects upon environment and human health due to its toxicity and bioaccumulation in various organisms (6) . The mercury concentration in water of southern Iraq could be arises from several sources which is natural presents in bed rock and soil ,local sources , air born ……etc (7) .The levels of mercury in the water and sediments of southern part of Iraq were studied spectrometricaly by Al – Imarh , (8) .The aim of this study is to investigate the Hg content in water and sediment at Al-Qarma and paper factory along Shatt Al-Arab River and compare the results with other studies.

Materials and Method

Water samples were collected from seven stations at Al-Qarma and paper factory along Shatt Al-Arab river and waste water treatment inside Basrah Paper Company, Fig. (1) and Fig. (2) also.Sediment samples were collected from the same stations , using grab sampler. Water samples were collected in each location about 5 L. After filtration of samples ,the chelating Ion-Exchange Pre-concentration Procedure (Riley and Taylor ,1968) were used to pre-concentrated the dissolved Hg ion from about 5L of the surface water by using (PERMUTIT) Ion-exchange resin . 50 ml of (2N) HNO_3 was used to elute the Hg ions using elution ratio (5 ml/min), the elutes were collected in beakers, then evaporate (at 70 0 C) to near dryness . 1 ml of conc. HNO_3 and (5- 10) ml of deionized water were added to residue and complete the volume to 25 ml by adding deionized water . All samples were stored in plastic bottles and sealed for Hg analysis. To 1gm of dried sediment were added (20) ml of (0.5N) HCl and the samples were evaporated for 16 h , centrifuged at 3000 rpm for 20 min and stored in 30 ml screw cap bottles for Hg analysis .The determination of mercury in water and sediment samples were achieved by means of Cold Vapor Atomic Absorption Spectrometry (CVAAS) using Shimadzo atomic absorption spectrometer mode (AA630-12) and mercury hallow cathode Lamp at (253) nm

RESULTS AND DISCUSSION

. Trace metals are natural constituents of all environments in which traces of all heavy metals are found in fresh water, sea water, aquatic and marine organisms and sediments. Mercury input may derive from a number of natural and anthropogenic sources. Among anthropogenic sources for several potentially toxic heavy metals such as Lead, Cadmium and Mercury landfills are sewage, waste water effluent ,power plants cooled water discharge,autoemission ,petroleum and petrochemical industry wastes ,storm drain outfalls and solid west

Table 1 presents examples of potential sources for Hg metal in the environment.

Table (1)

Industrial and agricultural source for Hg metal in the environment

Use
Batteries and other electrical
Pigments and paints
Biocides (pesticides, herbicides, Preservations)
Catalysts
Fertilizers
Dental and cosmetics
Fuel

Conc. of mercury in water and sediments samples were listed in Tab.(2,3). Levels of mercury in water ranged from 0.060 µg/gm at station (2)to 0.083 µg/gm at station (1) and in sediment from o.320 µg/gm at station (3) to 0.390 µg/gm at station (5)as shown in Fig.(2&3) respectively .

Table (2) conc. of mercury in water samples

Station	conc. µg/ml	PH	TDS ppm	conductivity ms
1	0.083	----	----	----
2	0.060	----	----	----
3	0.080	8.0	201	2.61
4	0.073	7.3	254	3.42
5	0.075	7.4	190	2.5
6	0.070	7.4	189	2.46
7	0.066	7.1	178	2.45

Table (3) Conc. of Mercury in sediment samples

Station	conc. µg/gm
1	----
2	----
3	0.320
4	0.374
5	0.390
6	0.350
7	0.346

All reported in this study for water and sediments from parts of Iraq were revealed an expected pollution in this area , and this pollution could be arises from different sources ,natural and anthropogenic . Among expected anthropogenic sources are : untreated industrial waste water , petroleum refuses , domestic wastes ……etc as shown in Table (1) .

The results showed that the levels of mercury in sediments are greater than in water due to the accumulation of mercury in the sediments , on the other hand the levels of mercury in water and sediments in station (5) is greater than the others in Qarmat-Ali river due to the mendaning in this side of the river which cause accumulation of this metal.
The main source of Hg in the discharge of paper factory is expected from electric cells of chlorine unit in paper Mill in Basrah . From the results of other studies it's showed that Hg conc. in this study is compatible to other studies as shown in Table (4).

Table (4) ;Comparisation of Hg concentrations (µg/g) in water and Sediment of various rivers, seas and oceans

Location	conc. Hg in water (µg/l)	Conc. Hg in sediment (µg/g)	References
North Adriatic coast (Croatia)	0.005-0.30	0.11-0.43	(9)
Kika river (Croatia)	--------	0.17-0.43	
Dubrovnik port (Croatia)	--------	1.45	
Northern Moroccan coasts	0.001-0.007	0.07-0.12	(10)
Gulf of Mexico	--------	0.029-0.248	(11)
Marshes of southern Iraq	0.01-0.023	0.06-0.15	(12)
North zone of Basrah	0.06-0.083	0.320-0.380	Present study

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