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ASSESSMENT OF HEAVY METALS CONTAMINATION IN GROUNDWATER SOURCES FROM IALOMITA COUNTY

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Introduction

Groundwater is an important source of drinking water supply throughout the world. In recent decades, the demand for fresh water has increased greatly due to the accelerated population growth and the development of the industry.
The environmental heavy metals pollution is consider to be a global concern due to their persistence, toxicity, bioaccumulation and non-biodegradability. The pollution of groundwater with metals is produce by anthropogenic sources such as metallurgy, melting, mining, galvanic processes, traffic and also as result of geological background.
Cu, Mn, Ni, Zn are micronutrients which are essential for living organisms, but over a certain concentration they become toxic.
Heavy metals such as As, Cd, Cr and Pb are toxic to living organisms regardless of concentration.
In order to prevent the chemical pollution with metals, drinking water quality assessment must be performed.
Pollution indices regarding metal concentrations are significant tools in monitoring process and have been successfully applied all over the world.

Materials and methods

The groundwater samples were collected from six drilling points from Ialomita County (South part of Romania): Slobozia (1), Urziceni (2), Cosereni (3), Garbovi (4), Reviga(5), Crunti (6). The samples were analysed using standard method (SR EN ISO 11885:2009) for the following metals: Al, Fe, Cd, Cr, Pb, Ni, Hg, As, Zn, Cu, Mn). The obtained values were compared with those imposed by the Romanian Legislation (Law 458/2004).

Results and conclusions

The result of mean concentration of metals are reported in Table 1.
The concentration values detected for Cu and Zn in the water sources were situated in the range between 1.0 to 3.5 µg/L and 1.3 to 16.1 µg/L respectively, while Ni ranged from 2.1 to 4.9 µg/L.

In all analysed water samples manganese concentration exceeding the maximum admissible concentration (MAC).
The concentrations of cadmium, mercury and arsenic are situated below the permissible levels imposed by Romanian Legislation.
Regarding Fe and Al, the values fall for Fe between 2.3 to 308 μg/L and, respectively 2.6 to 16.7 μg/L for Al.

Table 1. Mean concentration of metals and Pollution index (PI).

	1	**2**	**3**	**4**	**5**	**6**	**MEAN**	**PI**	**MAC**
Al (μg/L)	4.6	5.2	5.8	3.7	14.6	11.7	7.6	0.04	200
Fe (μg/L)	137.3	173.7	7.8	273.6	194.8	99.9	147.8	0.74	200
Mn (μg/L)	47.7	281.0	86.8	191.9	124.7	422.9	**195.2**	**3.85**	50
Cd (μg/L)	< 0.4	< 0.4	< 0.4	<0.4	<0.4	<0.4	-	-	5
Cr (μg/L)	3.2	2.8	<1.3	<1.3	0.0	3.1	2.3	0.04	50
Cu (μg/L)	<1	1.3	1.8	1.5	2.4	0.5	1.5	0.01	100
Pb (μg/L)	0.8	0.2	<0.15	0.6	0.8	0.3	0.31	0.05	10
Ni (μg/L)	2.8	<1.2	<1.2	3.9	<1.2	<1.2	0.5	0.17	20
Hg (μg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	1
As (μg/L)	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	-	-	10
Zn (μg/L)	4.1	7.7	5.9	2.6	2.5	9.1	5.3	0.001	5000

Pollution index (PI) is defined as the ratios of the concentration of individual parameter (Ci) against the maximum admissible concentration (MAC) and indicate relative pollution of each individual sample (table 1).
The values of PI greater than 1.0 indicates significant degree of pollution while values less than 1.0 shows no pollution.
PI values obtained for mangan in all investigated samples revealed that all water sources were polluted with manganese, higher Pi values could be a result of natural geological background.
The values obtained for other analyzed metals are lower than one, indicated no significant pollution.
In this context, the treatment process must be applied in order to reduce the content of manganese and to meet the conditions of drinking water quality.

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