

DETERMINATION OF ALUMINIUM CONTENT IN THE POTABLE WATER IN THE REPUBLIC OF MACEDONIA FROM THE PERIOD 2011- 2014

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Abstract

Aluminium is one of the heavy metal contaminants of great concern. Al is the most abundant element and occurs naturally by several mobility factors in the environment as silicates, oxides and hydroxides. Excessive addition of Al salts as coagulants in water treatment process might produce elevated concentrations of Al in final water.

Al salts are used to reduce organic matter, colour, turbidity, and micro-organisms levels.

The present study investigates Al content in the samples of drinking water in the Republic of Macedonia, which is obtained from different water sources, such as: springs, surface accumulations, underground accumulations and drilled wells. From January 2011 to November 2014, a total of 288 samples obtained from the public water supply systems at 25 measurement points distributed throughout the whole territory of the Republic of Macedonia were analyzed on the Al content. A graphite furnace atomic absorption spectrometry (GFAAS) was employed for the determination of Al content after wet digestion of the samples with nitric acid (67%, W/V) and hydrogen peroxide (30%, V/V). Mg(NO₃)₂ was used as an matrix modifier.

The results of the study revealed that Al content in the potable water originated from different water sources ranged from below limit of quantification set at 0.1 µg/L to 228 µg/L with the average median value of 21.7 µg/L. Al concentration was exceeded above maximum allowable concentration (MAC) of 200 µg/L in one of tested sample. Statistical evaluation of the results (ANOVA test followed by the Tukey's significance test) showed statistical differences between the Al content in potable water that comes from springs and underground accumulations ($p < 0.05$) vs. Al content in potable water that comes out from surface accumulations. Namely, the Al content in potable water that comes out from springs and underground accumulations was lower (average value 5.6 µg/L) in comparison with potable water that comes out from surface accumulations (average value 65.7 µg/L). This was due to the usage of Al based coagulant in the process of water treatment.

From the obtained results, it can be concluded that potable water from the water supply systems in the Republic of Macedonia contains Al well below established MAC, which is due to the usage of good sanitation system in the process of water production.

Keywords: Aluminium (Al), water supply system, graphite furnace atomic absorption spectrometry (GFAAS), maximum allowable concentration (MAC)