Surface water and soil sampling for arsenic content determination

S. Khmiadashvili 1, N. Poporadze2 M.Arabidze1, E.Bakradze1, G.Kuchava1 G.Sandodze1 L.Aptsiauri1

1. Introduction

Sampling is considered to be a crucial step in the analysis of inorganic compounds in the environment. This article describes field sampling techniques and provides detailed step-by-step procedures for collection and preservation of all major environmental matrices (water and soil). The aim is to signify the importance of sampling to the overall analytical procedure. Finally, quality control issues to be considered in environmental sampling are given.

2. Methodology

The sampling Procedure includes the following: the preparation of containers, collection of samples, preservation of samples, identification of containers and recording of the sample and environmental conditions of collection for traceability purposes;

For chemical analysis of arsenic the detailed procedures for specific collection, preservation and storage procedures have been documented based on the Georgian legislation for water - Decree of the Government of Georgia №26 January 3, 2014 Tbilisi on Approval of the "Sanitary Rules of Water Sampling" for soil Decree 38/N Approved by the Minister of Labor, Health and Social Affairs of Georgia on 24 February 2003 also depending the reference standard – (i) ISO 5667-3:2018 Water quality -- Sampling -- Part 3: Preservation and handling of water samples and (ii) Standard Methods for the Examination of water and wastewater,23rd Edition

The set of sampling bottles, types and volumes for each individual test must be detailed in the Sample collection / Reception instruction.

3. Results and discussion

Water samples were taken from the rivers: Sokhurtula, Kajiani, Lukhuni at the entrance to the Uravi Village, and near the confluence with the Rioni river.

All soil samples for the analysis were collected (20-25 cm) depth using sterile materials in hermetic plastic 50 ml flasks, transported to the laboratory at 4°C, and stored at - 20°C.

Soil samples were taken in the village Uravi, near the sarcophagus, near the ruined building of the factory and factory area.

The arsenic content in the water samples taken from the rivers did not exceed the maximum permissible concentration.

As for the soil, in comparison with the maximum permissible concentrations approved in Georgia, arsenic content in all the taken soil samples was above the norm.

4. Conclusions

This study highlighted that:

For any chemical analysis, the most important step is sampling and sample preparation. The purity of the sample should be ensured before taking a measurement to obtain the optimum results. Otherwise, the results will be always affected at least to a certain extent.

In the Ambrolauri region of Georgia, after the plants producing arsenic concentrate were closed in the 90s, plant premises were demolished and drums with arsenic waste material remained scattered around openly for some years.

In the past the Ministry of Environment took several efforts to initiate discussions on the issue with different line ministries, scientific institutions, NGOs, other experts as well as with local population to develop and implement effective measures.

The study shows that nowadays the situation has improved in comparison with the previous years as there wasn't observed high concentration of arsenic in surface waters;

In soils there was fixed the exceedance of permissible concentrations but still situation is better than it was in previous years.

References

[2]Georgian legislation for water - Decree of the Government of Georgia №26 January 3, 2014 Tbilisi on Approval of the "Sanitary Rules of Water Sampling";

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[2] reference standard – (i) ISO 5667-3:2018 Water quality -- Sampling -- Part 3: Preservation and handling of water samples and (ii) Standard Methods for the Examination of water and wastewater, 23rd Edition.