

PROBLEM OF ARSENIC DETERMINATION IN NATURAL WATER OF UKRAINE

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Geogenic arsenic is significant problem of huge amount of countries, especially China, India, Taiwan, USA, Mexico, Chile and many others. But Ukraine also has high level of arsenic in some natural waters. Fig. 1 demonstrates probability of geogenic arsenic contamination in groundwater.

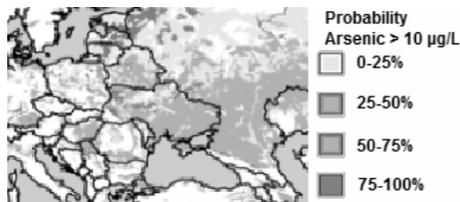


Fig. 1. Probability of insufficient arsenic level in Ukrainian groundwater [1]

Some Ukrainian territories, especially Carpathians, have very high probability (75-100 %) of groundwater with arsenic content higher than 10 µg/L, which is maximum allowable concentration of arsenic in drinking water according to Ukrainian regulations.

So, it is very important to control arsenic level in drinking water of these regions. But such modern methods as ICP-MS, ICP-OES, AAS are very expensive. Thus, photometric determination is the most useful method in Ukraine. There are two main approaches in photometric determination of arsenic concentration in natural water.

The first one is based on blue products of reduction of molybdoarsenic heteropolyacid [2]. Determination by the silver diethyldithiocarbamate is the second method [3]. Both these approaches have the same stages, especially transformation arsenic compounds in arsine AsH₃, which is gas with very high toxicity. So, these methods have very strict requirements in lab safety.

Silver diethyldithiocarbamate is not stable during long time, so it is important to produce this compound before determination. Silver salt is necessary component for synthesis of silver diethyldithiocarbamate, but it is expensive.

Ammonium molybdate is cheaper than silver salts. Conventional Ukrainian approach of arsenic determination uses iodine, ammonium molybdate, sulfuric acid and ascorbic acid. But this method has unsatisfactory detection limit, which is higher than maximum allowable concentration of arsenic in drinking water. Some compounds such as antimony potassium tartrate or ethyl violet can improve method sensitivity, but the result is not ideal. So, optimization of arsenic determination by ammonium molybdate is very actual and important for Ukrainian laboratories and drinking water treatment plants.

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References

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