INTER-LABORATORY COMPARATIVE TEST OF URANIUM CONCENTRATE ANALYSIS QUALITY

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Inter-laboratory comparative tests (ICT) were carried out to control technical competence and verify reliability of analytical results produced by six physical-chemical laboratories of several uranium-mining industry enterprises (Republic of Kazakhstan). The Laboratory of Engineering Ecology (LEE), Institute of Nuclear Physics, was chosen as the supervisory institution. Its task comprised as follows: 1) to make reference samples (RS) of uranium concentrate meeting the demands of usual reference materials; 2) to find uranium content (mass fraction) of these reference samples by analyzing them with the help of a reference analytical technique [1]; 3) to carry out statistical analysis and to interpret the ICT results.

RS of uranium concentrate with given properties were made and sent to six laboratories. In LEE uranium content of the reference samples was measured under the conditions of intra-laboratory precision according to [1]. The simple average of uranium concentrate mass fraction of the RS appeared to be 60.64%. Five different reference samples were sent to every laboratory to be analyzed according to scheme [2] and analytical technique [1]. The analytical data of seven laboratories (including LEE) were processed in the Laboratory of Engineering Ecology by statistical methods pursuant to [3]. Variance analyses revealed that relative contribution of intra-laboratory reproducibility error to the total analytical error is negligible comparing with inter-laboratory scattering of the results.

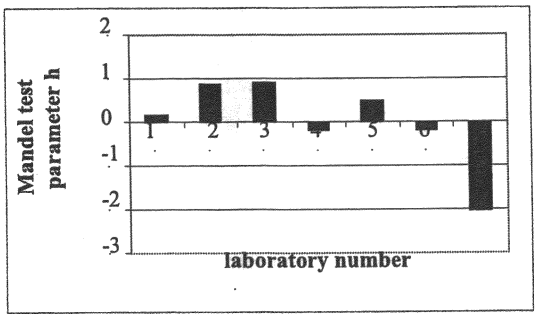


Fig. Values of inter-laboratory Mandel test

The whole data totality passed the uniformity test (Grabbs test), and Mandel test parameters (h and n) [3] characterizing inter-laboratory and intra-laboratory repeatability of the results were calculated (Fig.).

In the long run the ICT results were considered as satisfactory. Stable systematic deviation (with respect to the simple average), positive for laboratories №1, 2, 3, and 5 and negative for laboratories №4, 6, and 7 testifies for weak places in the system of continuous control of analytical results quality in enterprises' laboratories. All the laboratories should analyze the situation to carry out necessary correcting actions to eliminate the first causes of these stable systematic deviations.

References

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