

ACTIVITIES OF THE KYRGHYZ REPUBLIC IN THE FIELD OF PEACEFUL USE OF NUCLEAR ENERGY

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Scientists of the National Academy of Sciences of the Kyrgyz Republic since the sixties have actively been working over the problems of the atomic and nuclear physics achievements use in peaceful purposes in such fields as agriculture, geology, seismology, hydrology and others.

On the basis of a great volume of researches executed in the field of nuclear geophysics the discovery of phenomenon of the natural separation of uranium even isotopes has been made by Kyrgyz scientists (Chalov, Cherdyntsev). Due to this it has become possible to elaborate new approaches and uranium-isotope methods for the solution of hydrology and hydrogeology problems, to propose a new method of geological time measurement allowing to embrace the period in the Earth history, which can not be measured by other physical methods, and to get original scientific results, which are of a great interest for a number of Earth sciences.

Among these elaborations the greatest scientific and practical significance belongs to the following uranium-isotope methods:

- Modeling of processes of the underground waters forming and circulation in the zone of active water-exchange;
- Establishing of spatial conception of water-carrying horizons interrelation;
- Study of the flow and water sources distribution in the river basins;
- Identification of waters related to the fracture of the earth's crust.

Comprehensive approbation and using of these methods in Kyrgyzstan, Tajikistan, at the Northern Caucasus and in the northern regions of Russia confirmed the effectiveness of this method.

A number of priority results in this aspect have been received in recent years.

Before unknown “opposite” effect of even uranium isotopes separation under their precipitation on several specific sorbents from underground waters has been found out.

For the first time the spatial correlation has been determined between the anomalous excess of the easiest uranium isotope in the underground water and localization the ore substance that opens a new chapter in the practical use of the phenomenon of even uranium isotopes natural separation for the minerals search.

A new approach to the problem of the earthquakes forecast has been found by the isotope indices of underground water, which allowed to distinguish potential presages of seismic events time and parameters, which are useless for these purposes; principally new type of seismo-prognostic phenomena has been discovered.

The research of regularities of atmospheric fall-outs of nuclear explosions' products and processes of their washing-out from the troposphere in the conditions of foothills and high altitude territories are considerable contribution to the development of nuclear geophysics.

In the field of nuclear-physical methods of analysis the precise methods of the elements' isotope

compound measurements based on mass-spectrometry and induced separation of nuclei under irradiation by neutrons, methods of the radiation purity control of industrial products and express determination of useful components for efficient control of technological process of the rare metals production have been developed.

This trend of research is unique not only to the Republic but also to the world. This is an example of how the deep fundamental research has leads to the widely applied results.

Further development of uranium-isotope methods allowed their successful application for the solution of environmental problems. It is especially important, because Kyrghyzstan having rich natural resources was one of the major suppliers of the uranium raw material for the atomic and defense industry of the Soviet Union. At the present time mining of this raw material has been stopped in the Republic and uranium mines are closed. However after closing the uranium production the problems connected with it have not only remained, but also in some cases become more acute. At present there are 33 uranium tailings in the Kyrghyz Republic. It should be taken into consideration, that in the highlands this problem is very serious. Allocation of tailings and mines at the great heights above the sea level and highly broken ground create a special threat to the territories surrounding these objects and population. This is connected with the fact that getting out of the tailings and being washed by natural waters, toxic components create the threat of fast contamination of the vast territories as they spread in short periods of time for the great distances, since materials of tailings and mines practically always migrate with natural water, mud streams and high water.

This is a problem of not only domestic, but also of international aspect. The President and the Government of Kyrghyzstan have been giving special attention to the problem of the catastrophic break of tailings on ecology and agricultural production not only in Kyrghyzstan, but also in the neighboring countries because the rivers of Kyrghyzstan supply 5 Central-Asian Republics with water. Consequently, any breach of protective structures will lead to ecological, social and economic catastrophe in a number of countries that is the global problem.

In this connection, researches of Kyrghyz scientists in the field of nuclear geophysics directed at estimation of danger of tailings and mines of uranium production situated in the territory of Kyrghyzstan for the environment and human being are of a great value.

Uranium-isotope methods allow:

1. To elaborate practical methods and techniques of determining the direction of technogenic uranium and other toxic substances water migration and the spheres of their dispersion.
2. To determine the regularities of spatial distribution of radioactive and other toxic substances around the tailings.
3. To make the ecological maps of the territories contiguous with the tailings, with the selection of environmentally unfavorable areas of different extent of danger.

The scientists of Kyrghyzstan has substantiated and proved the earlier unknown possibility of differentiated quantitative determination of technogenic and natural uranium content in the environment. Such information allows to make an objective assessment of the danger for the environment of concrete burial places of radioactive wastes and enterprises processing uranium ore, objectively determine steps for their elimination and exclude groundless claims to enterprises and special services which must control the condition of tailings.

The method has no alternative, because except the non-equilibrium uranium for the present time there are no other reliable indicators which allow to distinguish the waters of tailings' settling and uranium mines from usual natural waters.

At the present these methods are used for the comprehensive studies of radiation and other danger of Northern Kyrghyzstan tailings accumulating the radioactive isotopes and containing toxic metals.

The elaborated uranium-isotope methods have wide area of usage. They have passed the comprehensive approbation and successful introduction in the Republics of NIS.

The important area of the radioactive isotopes to be used is agriculture. Kyrgyz scientists have developed the method of raising of the crop yield level with the use of isotopes and ionizing radiation. Also another development was the conception of natural radioactive nuclides spreading in the components of biosphere from arid to highland zones of their migration along the links of biological chain: rock-soil-water-plant-animal and recommendations for the environmental protection from radioactive pollution.

In the sphere of scientific cooperation, it is expedient to combine the scientists efforts for further development of the proposed methods with the aim of increasing the sphere of their practical use, because they are unique for the solution of a wide spectrum of problems in the sphere of nuclear geophysics, agriculture and ecology.

It will be the contribution of the scientists in realization of cooperation plans between Kyrgyzstan and Turkey under the slogan of our countries leaders: "Together to the XXI century".

Short information on participation of Kyrgyz scientists in the events Relating to peaceful use of nuclear energy

Participation of the Radiometric Laboratory of the Institute of Physics of the National Academy of Sciences of the Kyrgyz Republic in the International Conferences and Workshops on radiation ecology

Scientists of the Kyrgyz Republic are actively working on the problems of peaceful use of nuclear energy. Scientists of the Institute of Physics are to be mentioned especially. Below, the information on their participation in the events relating to peaceful use of nuclear energy is given.

1. "WISMUT" Internationale Konferenz 11.-14.07.2000 in Schlema

There was made a presentation: P. I. Chalov, V. I. Nifadiev, I. A. Vassiliev **"Evaluation actions on environment from uranium production by Kara-Balty combine"**.

2. In 2001 there was published an article by the above authors in the European journal MINE WATER: "Evaluating the Environmental Effects of Uranium Production at the Kara-Balty Mining Complex".

3. In 2001 the Laboratory team I. A. Vassiliev, V.M. Alekhina and S. Mamatibraimov made a presentation at the 3rd International Conference on NUCLEAR AND RADIATION PHYSICS held on 4-7 June 2001 in Almaty, Kazakhstan: **"The content and spatial distribution of ²²⁶Ra in soils of industrial objects and inhabiting zone of Kara-Balty Complex"** and there was prepared an article on the same topic in English for publication in the international scientific journal.

4. In September 2001 the Radiometric Laboratory organized and held the International Counsel on the **"Navruz"** Programme in the field of transboundary river monitoring between Republics of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan and the United States of America. The detailed information on this programme is available on the Internet at web-site <http://www.cmc.sandia.gov/Central/centralasia.html>, which is supervised by scientists of Sandia National Laboratories of the US Department of Energy.