

## DEVELOPMENT OF NUCLEAR ANALYTICS AND RADIOCHEMISTRY IN THE INP AS RU

**I. Sadykov, S. Khujaev, S. Bakiev, A. Kist, S.Kh.Egamediev**

*Institute of Nuclear Physics, Uzbekistan Academy of Sciences, Tashkent, Uzbekistan*

[ilkham@inp.uz](mailto:ilkham@inp.uz)

In the fifties the last century at creation of a network of the nuclear centers in republics USSR, including in Uzbekistan, to each centre the major main directions of researches have been setting. For Institute of nuclear physics of Academy of sciences of Uzbekistan, considering requirements of geology, mining industry and medicine of the Republic, such direction had been setting activation analysis and radiochemistry.

For development of these works at the Institute created the department of applied nuclear physics. The department was included four laboratories: application of radioisotopes in the technician, metallurgy, building and geology.

Now at our institute of research in this direction are carried out in 3 laboratories: Activation analysis; Activation analysis of pure materials and Nuclear chemistry. On the basis of these laboratories created Radioanalytical centre, Mobile radioanalytical laboratory and Testing radiological laboratory.

Researches on activation analysis and radiochemistry are carried out on the basis of the WWR-SM nuclear reactor and Cyclotron U-150.

The basic researches of laboratory activation analysis are directed on the decision of actual problems of ecology, geology, archeology, agriculture and medicine.

Techniques of the analysis of waters, aerosols, soils, plants, a foodstuff and other objects characterizing a condition of environment in the laboratory are developed. With use of these techniques are investigated a number of background areas of globe (Antarctica, Bering Sea, Black Sea, Pamir, Berezina, Sary-Chelek, etc.), and also the polluted regions and regions of ecological disasters (Chernobyl, Aral Sea region, Amu-Darya and Syr-Darya, etc.). For diagnostics and a prediction of various diseases in the laboratory are developed techniques of definition of microelement structure of hair, nails, blood serum and tissues. On the basis of these techniques works on mapping of Uzbekistan on structure of hair and blood of the person, the found out accurate correlations of the element status of an organism and a state of health at population level are carried out. These approaches are widely used now by medical institutions of Republic as an additional diagnostic sign.

The important results have been received in research of relationship of productivity of cotton (and other cultures) with element structure of soils. In laboratory carried out large-scale analyses of ore tests, approbations of chinks on the contents of gold and silver, definition of aggregation of gold-bearing, etc.

The basic direction of laboratory Activation analysis of pure materials is multi-elemental and high-sensitivity definition of microelement structure high purity materials: metals, alloys and especially semi-conductor materials with use of nuclear reactor. The important achievement in this area is development of methods activation the analysis of strongly activated materials (complex semiconductors of type  $A_2B_4$ ,  $A_2B_6$  and  $A_3B_5$ ). Exclusively high sensitivity of the analysis is thus reached at simultaneous definition of the big number of elements. Except development of techniques of the element analysis, the important data about properties and the physicist of the compensated semiconductors have been obtained and unique methods of definition and distribution of elements in semiconductors are developed.

Developed by these laboratories a complex of techniques neutron activation and XRF analyses are used on the basis of the Radio analytical centre and mobile radio analytical

laboratory for the decision of problems, geology, radio ecology and nuclear forensic, identification of illegally transported nuclear and radioactive materials.

In laboratory of Nuclear chemistry solved basically problems connected with manufacture of radio isotope production. In the seventieth years of the last century in laboratory the method of  $^{99}\text{Mo}$  recovery by activation of enriched  $^{98}\text{Mo}$  has been developed and created the radionuclide generator  $^{99}\text{Mo} \rightarrow ^{99\text{m}}\text{Tc}$ . At present in the laboratory are developed a number reactor and cyclotron radionuclide generators, such as:  $^{99}\text{Mo} \rightarrow ^{99\text{m}}\text{Tc}$ ,  $^{68}\text{Ge} \rightarrow ^{68}\text{Ga}$ ,  $^{103}\text{Pd} \rightarrow ^{103\text{m}}\text{Rh}$ ,  $^{113}\text{Sn} \rightarrow ^{113\text{m}}\text{In}$ ,  $^{188}\text{W} \rightarrow ^{188}\text{Re}$ , technologies of production of number radionuclide  $^{32,33}\text{P}$ ,  $^{35}\text{S}$ ,  $^{51}\text{Cr}$ ,  $^{54}\text{Mn}$ ,  $^{55}\text{Fe}$ ,  $^{57,58}\text{Co}$ ,  $^{65}\text{Zn}$ ,  $^{67}\text{Ga}$ ,  $^{68}\text{Ge}$ ,  $^{103}\text{Pd}$ ,  $^{109}\text{Cd}$ ,  $^{125,131}\text{I}$ ,  $^{153}\text{Sm}$ ,  $^{182}\text{Ta}$ ,  $^{188}\text{W}$ ,  $^{192}\text{Ir}$ ,  $^{198}\text{Au}$ , and also more than 10 various inactive sets for nuclear medicine.

On the basis of researches of laboratory of Nuclear chemistry in INP AS RU created branches "Radiopreparat" and «Tezlatgich which specialize on manufacture of ready radio isotope production, more than 50 names, for medicine and the industry.

Now in laboratory of nuclear chemistry are developed technologies of production of radionuclides  $^{147}\text{Pm}$ ,  $^{166}\text{Ho}$ ,  $^{177}\text{Lu}$ , etc.