THE FACILITIES AND THE ISOTOPE PRODUCTION IN THE INSTITUTE OF NUCLEAR PHYSICS IN TASHKENT

GULAMOV I.R., ABDUKAJUMOV M.N., YULDASHEV B.S.

The Institute of Nuclear Physics, Ulugbek, Tashkent, UZ- 702132, Uzbekistan
(Fax -- 7-3712-642590)

We present a short review of the isotope production facilities at the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences in Tashkent. The parameters of the various types of reactor and cyclotron isotopes as well as labelled compounds that we have been producing and supplying within the last 10 years represented.

The Institute of Nuclear Physics was founded in July 1956. The establishing of the Institute opened broad perspectives for developing nuclear science and technology in the Central Asia. The major directions of the Institute's activities include the basic nuclear research and its wide application to the science and national economy of the Central Asian region.

In September 1959 a water-water reactor (WWR-SM) with the power of 2MW, the first reactor in Central Asia was put into operation. In 1980 it was reconstructed to be suited to the new requirements for the physical parameters and safety standards with the power being increased up to 10,000 kW. Now it has 40 vertical and 9 horizontal channels with a neutron flux in the range from 10^{12} to 10^{14} n sm^{-2} sec^{-1}. The reconstruction has provided conditions for essential broadening of the scope and quality of the studies carried out.

The same year a unique γ-source facility of a water-pool type with 3 γ-irradiators was installed with the total number of the γ-sources about 446 and activity up to 470 Ci.

During the period of 1960-1964 several new facilities had been designed, constructed and put into operation. Among them there is a 150 cm cyclotron U-150-II with the energies of the accelerated protons up to 22 MeV, deuterons up to 24 MeV, α-particles up to 50 MeV and ^{3}He nuclei up to 50 MeV. Recently, the new compact cyclotron U-115 has been designed and, now, it is under preliminary test work. Being planned to put into operation in 1995, U-115 will let to accelerate the protons to 20 MeV with internal intensity ~300μA.

At present the Institute has different operating facilities, that allow the scientists to carry out various researches in the fields of nuclear physics, activation analysis, radiation solid state physics and radiation material science.

The Institute has also some divisions --. "RADIOPREPARAT" (reactor isotope production), "TEZLATGICH" (cyclotron isotopes) and others. The "TEZLATGICH" enterprise has been making cyclotron-produced ^{57}Co radionuclide deliveries for export. "TEZLATGICH" has a powerful accelerator and radiochemical laboratory of a full cycle to produce ^{57}Co in an industrial range about 50 Ci per year. After starting U-115, the additional production capacity will be available.

The "PADIOPREPARAT" enterprise has been producing and exporting preparations, compounds and other articles with radioactive isotopes for use in medicine and research to the USA and countries of Europe and the Commonwealth of Independent States for more than 15 years. The list of products includes more than 60 items. The applied technologies are unique and patented. The quality of the production is of world market standards.

The facilities of the Institute have made it possible to develop intensively a technology for obtaining radionuclides and organize the production of radioactive isotopes and labelled compounds for medicine, agriculture, industry and biology. Among the theoretical works in the field of radiochemistry, the most well known one is a mathematical simulation of the chromatography of substance microquantities, permitting a more correct description of the regularities of component distribution on a column at definite stages of the process. The works related to optimization of the regimes of the irradiation of initial materials to obtain required radionuclides are also going on well.

At present, phosphorous-32, phosphorous-33 and cobalt-57 radioisotopes are produced in industrial quantities and a technology for obtaining gallium-67, promethium-147, cerium-139 and many others have been developed as well. The characteristics of available isotopes are represented in the Table 1, 2. On special request many other isotopes can be produced and delivered.

Table 1: The main characteristics of cyclotron radionuclides

Radionuclide	$T_{1/2}$	Specific activity, mCi/mg	Radionuclide purity, %
^{57}Co in 0,1 M HCl	271.8d	>6500	>99.8
*) ^{65}Zn in 0,1-0,5 M HCl	243.9d	>50	>99.5
*) ^{55}Fe in 0.5 M HCl	2.68yr	>2	>99.0
*) ^{67}Ga in 0.5-1.0 M HCl	3.26d	>5000	>99.5
*) ^{68}Ge in 0.5-1.0 M HCl	270.8d	>100	>99.5
*) ^{109}Cd in 0.1-0.5 M HCl	426.2d	>500	>99.9
*) ^{111}In in 2.0 M HCl	2.8d	>100	>99.5
*) ^{139}Ce in 0.5 M HCl or in 2.0 M HNO_3	137.7d	>20	>99.8

*) On special request

Table 2: The main characteristics of reactor radionuclides.

Radionuclide	$T_{1/2}$	Specific activity, Cu/mmol	Radionuclide purity, %
/^{32}P/orthophosphoric acid, carrier free, in 0.04M HCl	14.3 d	8500-9000	>99.0
/^{33}P/orthophosphoric acid, carrier free, in 0.04M HCl	24.7	4500-5000	>99.0
/^{35}S/sulphuric acid in water	87.4d	1200-1500	>98.0
Sodium/^{125}I/iodide, labelling solution in 0.02-0.05 M NaOH, reductant free	60.0d	>2000	>99.99
Sodium/^{131}I/iodide, labelling solution in 0.02-0.05 M NaOH, reductant free	8.0d	>2000	>99.99
^{198}Au-comysol	2.7d	750 MBq/mg	>99.0

For additional information you can contact to 702132, Uzbekistan, Tashkent, Ulugbek settl., Institute of Nuclear Physics of Academy of Sciences, Tel. (3712) 64-15-52, Fax. (3712) 64-25-90.