Iodine-124 (T$_{1/2}$ = 4.18 d) and copper-64 (T$_{1/2}$ = 12.7 h) are two very important radionuclides for radiopharmaceuticals production for preclinical research in a positron emission tomography (PET). The method for producing $^{124}$I was based on a dry distillation of $^{124}$I from a solid $[^{124}$Te]$\text{TeO}_2$ target technique. The platinum target disk was used as a base for TeO$_2$ melt and irradiated on COSTIS target station installed at the end of the external beam line of the IBA Cyclone 18/9 cyclotron. The target station was equipped with a 25 µm aluminum or 250 µm Nb window foil in front of the target, which results in a final beam energy of 17.7 or 13.5 MeV respective.

The $^{64}$Ni(p,n)$^{64}$Cu reaction route was used for $^{64}$Cu (T$_{1/2}$ = 12.7 h) preparation because its entrance channel is accessible at low energies and yield of the reaction is quite high. Disadvantage of the reaction used is high price of enriched $^{64}$Ni. Gold and platinum targets were used for a thick $^{64}$Ni target preparation by electro deposition. Because the external beam line of the cyclotron has no beam diagnostic devices, several aluminum plates were irradiated in the COSTIS target station with a 5 µA proton beam for 5 min with different settings for the beam focusing quadrupole magnets. After 15 minutes decay time the plates were scanned by a TLC scanner along the horizontal and vertical central axes of the plates in order to visualize the beam shape. The settings providing the most homogeneous beam spot on the target were selected and used further for the actual target irradiations. The radionuclidic purity of the product was determined by γ-spectrometry.
Carbon-11 (T_{1/2} = 20.39 min) was prepared in the form of methane in aluminum target made by IBA. Total irradiated volume of the gas mixture (90% N₂ +10%H₂) was 50 cm³. Reaction used at irradiation was ^{14}N(p,α)^{11}C. Aluminum and niobium windows were used during irradiation. The irradiations were performed first without and then with niobium foil inside the target with purpose to eliminate the surface influence of aluminum. During the optimization of irradiation, different pressures of gas were tested as well as the beam currents. Produced methane was sorbed on Carboxen 1000 column at the temperature of -150 °C on TracerLab FXC module made by GE Medical Systems.

Acknowledgement

The authors are indebted to IAEA Vienna for financial support during realization of TC Project SLR/4/010 Production of the Positron Emitting Radionuclides and the work connected with Cu-64 production was supported by the Slovak Research and Development Agency under the contract No. VMSP-P-0075-09