Contribution ID: **228** Type: **Oral report**

Obtaining of the Zr-89 medical isotope in the (γ, αn)-reaction

Tuesday, 13 October 2020 14:40 (25 minutes)

The modern medical method of nuclear visualization based on monoclonal antibodies, the new carriers of the radioactive label, is Immuno-PET. For its realization, it is necessary that the biological half-life of the molecule, the label carrier, coincides with the half-life of the radioactive isotope. The ^{89}Zr isotope has optimal physical characteristics for Immuno-PET: it decays with a half-life of 78.41 hours by positron emission and electron capture to the intermediate state ^{89m}Y, which decays to stable ^{89}Y with half-life 15.7 s.
Traditionally, ^{89}Zr is produced with cyclotrons in the (p, n)- and $(d, 2n)$-reactions. However, in both methods, the exclusion of ^{88}Zr isotope impurities with a half-life of 83.4 days and its daughter ^{88}Y isotope with a half-life of 106 days resulting from $(p, 2n)$- or $(d, 3n)$-reactions presents a significant problem.
Therefore, an urgent task is to study the ^{89}Zr yield in various photonuclear reactions.
We irradiated a ^{94}Mo enriched molybdenum target and a tantalum monitor target using an electron accelerator with a 20 MeV maximum electron energy.
The spectra of irradiated targets were measured by Canberra and Ortec gamma spectrometers with ultra-pure semiconductor detectors with a (15–40)% detection efficiency compared to a 3′×3″ NaI(Tl) detector. The energy resolution of the spectrometers was 1.8–2.0 keV on the 1332 keV ^{60}Co γ-line. In the studied spectrum, γ-transitions from ^{89}Zr decay are reliably identified. The bremsstrahlung spectrum was simulated using the Geant4 software code.
As a result, we obtained the integral cross-section for the ^{94}Mo(γ, n)^{89}Zr reaction equal 4.5 mbn×MeV. The ^{89}Zr yield is 5×10^{4} Bq×μA×hour. Obtained data are discussed.

Primary author: ZHELTONOZHSKAYA, Marina (Lomonosov Moscow State University)

Co-authors: Mr REMIZOV, Pavel (Lomonosov Moscow State University); Dr IATSENKO, Vladimir (A.I. Burnasyan Federal Medical Biophysical Center of Federal Medical Biological Agency, Moscow, Russia); Prof. CHERNYAEV, Alexander (Lomonosov Moscow State University)

Presenter: Mr REMIZOV, Pavel (Lomonosov Moscow State University)

Session Classification: Section 8. Nuclear medicine

Track Classification: Section 8. Nuclear medicine.