Measurement of activation cross sections of alpha particle induced reactions on iridium up to an energy of 50 MeV†

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195mPt has proper decay characteristics for internal therapy investigations (\(T_{1/2} = 4.03\) d, \(I_T = 100\%), \(E\gamma = 98.9\) keV, and \(I_\gamma = 11.4\)%). This isomeric state transfers its energy by internal transition and emits low energy gamma photons, conversion electrons, and Auger electrons with high intensity. Owing to the low energy of the emitted conversion and Auger electrons, their energy is deposited in a very short range and thus, most parts of the deposited energy get concentrated in a small volume, preferably in a single targeted cell. In addition, its low energy gamma photons can be used for imaging. 195mPt can be attached to platinum complexes, which are used for chemotherapy, and thus, it can be used as an effective anti-tumor agent in radiotherapy.

The 195mPt for medical applications is produced in reactors in the 193Pt(n, \(\gamma\))195mPt reaction with a moderate yield and low specific activity. Charged particle induced reactions may provide high specific activity isotopes. Several production routes to produce 195mPt were investigated previously but the natIr(\(\alpha, x\))195mPt reaction was not studied. The high spin isomeric state (13/2+) of 195Pt can be formed in a reaction with particles capable to transfer high angular momentum. Thus alpha particle bombardment is one of the best ways to produce this radionuclide.

We measured the cross sections of alpha particle induced nuclear reactions on natural iridium using a 51.2-MeV alpha particle beam. The standard stacked-foil target technique and activation method were applied. The activity of the reaction products was assessed without chemical separation using high resolution gamma spectrometry based on a HPGe detector (ORTEC GEM-25185-P).

Two stacks containing Ir target and Ti monitor foils were irradiated at the AVF cyclotron in the RIKEN RI Beam Factory, Wako, Japan, in a Faraday-cup-like vacuum chamber equipped with a long collimator, assuring a small solid angle for the escaping secondary electrons. The initial beam energy was confirmed by the measurement of time of flight before and after the irradiation.† The beam current was kept constant during the irradiation. The beam parameters were also monitored by the natTi(\(\alpha, x\))51Cr monitor reaction.

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