ABSTRACT

As theranostic pairs have revolutionized the field of nuclear medicine by simultaneously providing the diagnostic and therapeutic results. Two most salient isotopes of arsenic also make such an advantageous theranostic pair i.e. ^{72}As/ ^{77}As. ^{72}As being a positron emitter works a diagnostic radionuclide while ^{77}As is β- emitter which provides the therapeutic effects. The main focus of this work is to elucidate the production of ^{72}As via charged particle induced nuclear reactions on ^{nat}Se, ^{74}Se & ^{76}Se. The positive attributes of ^{72}As make it a promising candidate for PET, including its high β+ emission intensity and low electron capture percentage, strong decay intensity, and a half-life (26h) suitable for PET. For this purpose all the accessible experimental data is gathered and normalized where necessary using decay data and monitor reactions. Comparison of the experimental data with theoretical nuclear model calculations is also done using nuclear model codes such as TALYS 1.9, ALICE IPPE and EMPIRE 3.2. Furthermore, we computed the ratio between experimental and model-derived data to verify that the data points remained within the 3σ boundary of the polynomial fitting. We also presented the recommended data for these specific reactions, including their associated 95% upper and lower limits. Lastly, we conducted an impurity analysis for the production of arsenic-72 from these reactions to assess the impact of unintended radionuclide impurities.