ABSTRACT

In this dissertation, production of Gallium radioisotopes (^{68}Ga & ^{67}Ga) has been investigated. Literature review has been carried out with scrupulous attention regarding production via different routes and finally alpha particle induced nuclear reactions on enriched copper (^{65}Cu) have been selected for case study (i.e. ^{65}Cu(α,n)^{68}Ga & ^{65}Cu(α,2n)^{67}Ga). Established methodology by IAEA aids analyzing production (^{68}Ga & ^{67}Ga) from the very first step; collection of data from sources and take it to final results. Evaluation methodology was executed on compiled data for normalization, correction, comparison and recommendation of cross sections for nearly impurity free optimized production. The experimentally measured data were incorporated to produce excitation function and corroborated owing theoretical model calculations performed by nuclear model codes TALYS-1.95, EMPIRE-3.2.3 and ALICE-IPPE. The inconsistencies in the data were ameliorated by exercising statistical fitting. Numerical simulations were brought into play for statistical analysis. Thick target yield for the reactions ^{65}Cu(α,n)^{68}Ga and ^{65}Cu (α,2n)^{67}Ga has been deduced from the recommended cross sections. A careful impurity analysis was accomplished to identify impurity contribution during production of desired radionuclide. An energy region was suggested for both reactions separately to produce nearly impurity free radioisotopes which can help to enhance their clinical utilization.