The Covariance Analysis of $^{nat}Sn(\alpha,x)^{122}Sb$ Nuclear Reaction Cross Sections

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In nuclear medicine, a range of radioactive isotopes are employed for therapy and diagnosis. Several types of radioisotopes are produced by alpha-induced reactions with different types of targets. In this study, we have used ^{nat}Sn as a target material and alpha particle as a projectile. The radioisotopes $^{116,\ 117,\ 118,\ 119,\ 121,\ 123}Te$, $^{117,\ 120,\ 122,\ 124,\ 126}Sb$, ^{117}Sn and ^{111}In are produced from $^{nat}Sn(\alpha,x)$ nuclear reactions. In this work, we have obtained the production cross sections for $^{nat}Sn(\alpha,x)^{122}Sb$ nuclear reaction in the incident alpha energy range of about 24–40 MeV. The experiment was performed at K-130 cyclotron, VECC, Kolkata, India for this study. The stacked foil activation technique followed by the offline gamma-ray spectrometry was used to measure the reaction cross-sections for the $^{nat}Sn(\alpha,x)^{122}Sb$ nuclear reaction. The uncertainty propagation in the measured cross-sections was calculated using covariance analysis by taking into account the micro-correlation between various variables such as particle number density, efficiency of the HPGe detector, decay constants and counts etc. [1-3]. The measured cross sections for the $^{nat}Sn(\alpha,x)^{122}Sb$ nuclear reaction are shown in Fig. 1 along with previous experimental results from EXFOR and theoretical calculations from the TALYS nuclear code. More details about the experimental setup and data analysis will be presented during the conference.

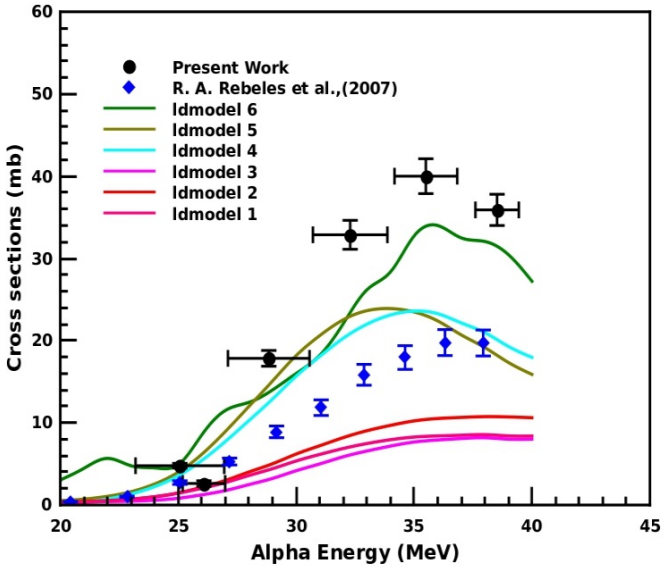

Fig.1: The measured cross sections for the $^{nat}Sn(\alpha,x)^{122}Sb$ nuclear reaction along with previous experimental results from EXFOR and theoretical calculations from the TALYS nuclear code.

References

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