



^{45}Ti - Titanium: from cyclotron production to potential applications evaluation

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Introduction: Thousands of radioisotopes are known and virtually all may be artificially produced, however clinical applications of PET imaging are mainly based on ^{18}F , ^{11}C , ^{13}N and ^{68}Ga . This trend could change in the near future, since several groups worldwide are busy developing very promising new entities aiming to contribute for spreading the use and efficacy of clinical diagnostic using Nuclear Medicine imaging techniques. Our group is developing ^{45}Ti -Titanium, assuming it as a potential candidate, since presenting interesting properties: physical half-life of 3.09h, together with relevant chemical properties, that enable radiolabelling with bifunctional chelates, ligands or could even be useful for studies concerning the distribution of new titanium-based chemotherapy drugs or titanium oxide nanoparticles. Considering that data characterizing excitation functions is necessary for radionuclide optimal production, this work aims to disseminate results regarding the determination of excitation function of $^{45}\text{Sc}(p,n)^{45}\text{Ti}$ reaction, studied as a potential route to produce ^{45}Ti in low energy cyclotrons.

Methods: The stacked foil technique was applied, based on Sc foils mounted on an aluminum target holder and interspaced with natCu foils, with irradiation using 16 MeV and 18 MeV cyclotrons. Results of activation study were evaluated using a MCA and HPGe spectroscopy.

Results: The most important properties of Titanium-45 and also the most important considerations and challenges for its production and application will be presented, with complete excitation functions for the above mentioned maximum proton energies determined and compared with theoretical results already available from internal works based on TALYS Monte Carlo code determinations.



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Conclusions: Our results point into the practical feasibility to obtain significant quantities of ^{45}Ti using low energy cyclotrons, enhancing the interest for further development of this new agent for PET imaging.



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