A thermal simulation of a solid target for 100 MeV proton irradiating

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Solid targets have played a great role in nuclear medicine with the production of novel medical radioisotopes with 100 MeV proton beam[1]. A disk target design has been investigated for the production of medical radioisotopes for irradiation up to a maximum 300uA of proton beam current. The yields of radioisotope production from the solid target depends on the intensity of proton beam, which causes heat to melt the target materials. Therefore, it is useful to consider the energy loss in the target and coolant, heat transport through target and supporting equipment (windows, coolant) before designing the target by means of computer modeling. In this study, the COMSOL Multiphysics program was used to calculate the heat transportation in the solid target. The heat transport inside the target were modeled and the maximum temperature of target was estimated. The SRIM (Stopping and Ranges of ions in matter, include TRIM) 2003 program was used to calculate energy loss in targets and coolant. The SRIM is a group of programs which calculate the stopping and range of ions into matter using a quantum mechanical treatment of ion-atom collision. The optimized proton currents to the target will be determined maximal allowed heat flows which are fixed in melting point of target material. From the results, we can predicts and provides an understanding of temperature profiles within various target configurations.

References

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