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Reliability Study of The Liquid Target Chamber for F Production at The BATAN's Cyclotron Facilities.

I.Kambali,T.Heryanto,Rajiman, S.Ichwan.

Abstrak

The liquid target chamber for F production at the Cyclotron Division. Center for Radioisotopes and Radiopharmaceuticals (PRR) of the National Nuclear Energy Agency of Indonesia (BATAN) has been analyzed for its reliability in enduring high pressure and heat transfer requirements during proton beam bombardment as well as the recommended irradiation parameters for effective F production. The target chamber was subject to house the O-enriched water bombarded with high energy proton beam to produce F. A range of SRIM-computer simulations have also been conducted to calculate the ranges of several energetic photon beams (of up to 20 MeV) into pure water target. A study of radioactive impurities which might be produced from the proton-irradiated chambers materials was also included based on some references. Due to concern over the heat produced during target irradiation, a heat transfer analysis particularly for the targets cavity was also included in the presented studies to obtain a brief preliminary calculation of the heating impacts prior to irradiation test. The calculation was performed for various proton beams currents and energies of up to 30 microAmpere and 20 MeV respectively. It was found that the chamber was reliable for production of F from proton irradiated O-enriched water target by maintaining the chambers pressure of up to 3.6 bar if the proton beam current was kept below 16 microAmpere for all energies or the proton beam energy was kept to or below 10 MeV for any employed beam currents. The overall heat transfer coefficient was also found to depend on the power deposited into the water target.