^{67}Cu Production by Photon Activation of ^{71}Ga

H. Areti, P. Degtiarenko, K. Jordan, G. Kharashvili

Jefferson Lab

^{67}Cu is a desirable radionuclide for both therapeutic and diagnostic purposes. The efforts to establish a reliable supply of ^{67}Cu have exclusively focused on proton, neutron, and photon activation of zinc. We investigate feasibility of ^{67}Cu production via the $^{71}Ga(\gamma,\ \alpha)^{67}Cu$ reaction using a high power electron accelerator (U.S. patent pending). Despite a modest cross-section of this reaction, physical properties of gallium (wide temperature range in liquid state and low vapor pressure) make the method potentially competitive. FLUKA Monte Carlo code was used to optimize gallium irradiation setup and to calculate ~50 mCi/h production of ^{67}Cu using a 50 kW electron beam on a ^{71}Ga target. In the absence of an isotopic gallium sample, natural gallium target was used to experimentally validate the FLUKA calculations. Measuring ^{67}Cu yields in activated natural gallium is difficult due to the interference from the production of ^{67}Ga, which decays with similar half-life as ^{67}Cu and produces identical energy decay photons. Therefore, the activation study was conducted using electrons with 18.5 MeV energy, which is the threshold of the $^{69}Ga(\gamma,\ 2n)^{67}Ga$ reaction. Results of the validation study and projected ^{67}Cu yields at higher energies are presented.