

Feasibility Study of D-D Neutron Generator as a Replacement for Cf-252 Source in Neutron Activation Analysis

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A neutron generator producing 2.45 MeV neutrons with d-d reaction is fabricated for industrial material identification with neutron activation analysis (NAA). The neutron generator consists of a deuteron plasma source and a Ti-coated Cu target and is expected to produce 108 n/s at maximum operation. The target is supplied with 100 kV bias voltage with 1 mA deuteron at maximum operation. With variation of operating parameters such as applied bias and source voltage, and input deuterium gas flow, the neutron yield from the target is measured with a neutron detector. The neutron detector consists of EJ-301 liquid scintillator, and the yield is calibrated with an MCNP simulation. Finally, material samples from industrial elements such as Fe, Co, and Ni are irradiated by the neutrons to measure the neutron activation peaks via characteristic gamma rays. The feasibility is determined in consideration of measurement time and accuracy for a practical application.

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