

Public Abstract

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Title:MONTE CARLO NEUTRONIC SIMULATIONS FOR A NEW APPROACH TO PARAMETRIC INAA AND Mo-99 PRODUCTION FEASIBILITY AT MURR

A novel approach to parametric instrumental neutron activation analysis at University of Missouri Research Reactor (MURR) has been established using a detailed MCNP5 steady-state model of the MURR core. The model, which was based on the most recent continuous-energy neutron data from the Evaluated Nuclear Data Files and Japanese-European Fusion Files, was used to accurately predict (i.e., within 5% of measurements), the intrinsic neutron-capture reaction rates for a range of different nuclides in irradiation channel ROW2. Using the predicted reaction-rates, trace-elemental concentrations were determined in NIST standard reference materials, bovine liver, obsidian and coal fly ash. The agreements with the certified elemental concentrations were generally within 5%. The new methodology has produced agreements with the certified values that are better for a greater number of elements than the establish method, k0. The MURR core model was also combined with other nuclear burnup codes to test the feasibility of Mo-99 production at MURR from fissioning LEU. Predictions of the Mo-99 end-of-irradiation yields are within 3% of the measured value. This dissertation entails a complete study of the MCNP5 model and the new neutron activation analysis method.