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Schaesbergerweg 25
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Use of the k0-INRIM 2.0 software in k_0-INAA

M. Di Luzio*, G. D'Agostino

Affiliation: Istituto Nazionale di Ricerca Metrologica (INRIM), Unit of Radiochemistry and Spectroscopy c/o Department of Chemistry, University of Pavia, via Taramelli 12; 27100 Pavia, Italy

*Corresponding author: m.diluzio@inrim.it

Abstract

The k0-INRIM software is a homemade program developed by the Istituto Nazionale di Ricerca Metrologica (INRIM) to provide GUM compliant uncertainty budgets while performing k_0-standardization Neutron Activation Analysis. The imminent release of its 2.0 version is going to represent a substantial upgrade to the initial code implementing improvements concerning every aspect compared to the original project. In particular, the whole detector characterization process is optimized in order to be performed, on multiple counting positions, based exclusively on experimental data obtained from γ-sources; the measurement model is modified accordingly with addition of features, such as the possibility to evaluate efficiency for monitor and analyte at different non-reference counting positions, and multiple corrections, accounting for extended sample geometry, self-absorption, neutron flux gradient, moisture and blank. On top of that, algorithms for automatic calculation of key inputs parameters and features optimizing the software use are implemented. The user interface is completely revamped to accommodate the applied changes, include the additional input parameters and guide the user through the suggested workflow.

The present work focuses on describing the new version of the k0-INRIM software from a user's point of view by presenting the main improvements while following a step-by-step process showcasing a real analysis as an example. Quantification of a number of analytes in the investigated sample is performed as recommended by the code creators in order to achieve the best results, starting from the initial software setting, key input parameters evaluation, γ-spectra recalling and γ-emission identification ending with the review of analysis results and production of uncertainty budgets.

Beside the primary goal of automatically output GUM compliant uncertainty budgets of the quantified elements, the software code has been distributed as open source in order to be adapted to specific experimental setups that might differ depending on k_0-NAA laboratory. The INRIM knowledge is available for users who might be willing to include the use of k0-INRIM software to their analysis workflow.