

First IAEA Research Co-ordination Meeting on

Reference Database for Neutron Activation Analysis

(Guidelines to participants)

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IAEA, Vienna Austria

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Objectives

The main purpose of the present note is to define the scope of work to be done prior to the meeting to identify problem areas, topics for discussion at the meeting and sharing of the work. The overall objectives of the CRP are described in details in other documents that had already been circulated.

Preconditions and Assumptions

The reference tool for processing the results of gamma-spectra analysis is the k0-IAEA program package. It is assumed that all participants supplying experimental results from activation analysis will be able to supply the results processed with the k0-IAEA software in parallel to any other they might be using. The purpose of this exercise is to identify and eliminate (if possible) the influence of the differences in the nuclear database and the processing methods.

The main reason for choosing the k0-IAEA package as reference is having access to the source code and the nuclear database, if required.

Note that the requirement for the installation of the k0-IAEA software is irrelevant for those participants who will not do the actual measurements by the k0 activation method.

Organisation

The work-groups are identified:

1. Detector calibration and corrections (coincidence counting, dead-time corrections, geometry, gamma-attenuation, self-shielding, etc.).
2. Neutron spectrum characterisation (conventional techniques for activation analysis, spectrum unfolding, computational methods, direct experimental measurements, etc.).
3. Processing methods (dependence of the results on the methods - software intercomparison).
4. Nuclear database (integral constants for the k0 method, relation between the differential and integral data).

Every participant will be expected to take part in more than one of the above activities.

Voluntary contributions from external researchers will be accepted and acknowledged in the final documentation, provided that they meet the required quality criteria.

A dedicated web site will be maintained at the Agency for a rapid exchange of information.

Tasks

The tasks within the CRP will involve the following:

- Problem areas in NAA nuclear constants for specific materials are to be identified before the start of the CRP:
 - Primary list containing materials where discrepant results were obtained in the measured constants for NAA in spite of all precautions. Preliminary list will be provided by the Agency. The list will be elaborated at the Meeting.
 - Secondary list where significant discrepancies exist between directly measured constants and those calculated from the basic differential data in various databases. Preliminary list will be provided by the Agency. The list will be elaborated at the Meeting.
- Methods development and optimisation:
 - The k0-IAEA software and database must be verified by comparison with other software packages. Extensions must be implemented as necessary.
- Characterisation of the neutron spectrum in irradiation facilities, including:
 - Direct measurements by the TOF method or otherwise
 - Spectrum unfolding by foil activation.
 - Computational simulation by Monte Carlo method.

Conventional methods used in NAA may be adequate for analytical work on irradiation facilities with well-thermalised spectra, but for the determination of the nuclear constants much more stringent criteria need to be applied, based on a combination of the methods listed above.

- New activation measurements will be required, focusing on:
 - Materials from the primary list; special attention will be paid to spectral effects.
 - Materials from the secondary; the number of materials addressed will depend on the available qualified manpower resources.

The pre-condition for acceptability of the measurements is good characterisation of the neutron spectrum, discussed in the previous item. Use could be made of data validation integral benchmark experiments for selected materials performed at Geel, where the neutron spectrum is known with a high precision, if such experiments will be performed.

- Revised data is to be generated from the cross section data for the following quantities:

- Effective resonance energies calculated directly from the cross section data.
- Cadmium transmission factors calculated directly from the cross section data.
- Generalised g-factors for specific irradiation facilities where new measurements are performed, if deviations from a Maxwellian shape are significant; otherwise the tables from the PGAA web site could be adopted.

The data will be provided by the Agency.

- For the purpose of implementing resonance self-shielding corrections into the k_0 -IAEA software, the following is to be provided by the Agency:
 - Library of self-shielding factors tabulated as a function of the Bondarenko background cross section, calculated with the NJOY data processing system using the flux calculator option that solves the slowing-down equation explicitly.
 - Routine for interpolating the self-shielding factor tables.

The data will be provided by the Agency.

Presentations at the Meeting

Participants should avoid lengthy presentations of the past work. If considered relevant, copies of published works could be distributed to the other participants at the meeting. Presentations should focus on the scope of the work they plan to do for the CRP.

Presentations should be of 15-minute duration, with about 5 minutes for discussion.

The Agenda for the meeting is given separately.

Social event

The proposal is to visit a typical Viennese restaurant, with the arrangement that everybody pays the food for himself, but the Agency offers the drinks. Please, confirm your participation in the social event.