

Database of Prompt Gamma-rays from Slow Neutron Capture for Elemental Analysis

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The increasing importance of Prompt Gamma-ray Activation Analysis (PGAA) in a broad range of applications is evident, and has been emphasized at many meetings related to this topic (e.g., Technical Consultants' Meeting, use of neutron beams for low- and medium-flux research reactors: radiography and materials characterization, International Atomic Energy Agency (IAEA) Vienna, 4-7 May 1993, IAEA-TECDOC-837, 1993). Furthermore, an Advisory Group Meeting (AGM) for the Co-ordination of the Nuclear Structure and Decay Data Evaluators Network has stated that there is a need for a complete and consistent library of cold- and thermal-neutron capture gamma-ray and cross-section data (AGM held at Budapest, 14-18 October 1996, INDC(NDS)-363); this AGM also recommended the organization of an IAEA CRP on the subject.

The International Nuclear Data Committee (INDC) is the primary advisory body to the IAEA Nuclear Data Section on their nuclear data programmes. At a biennial meeting in 1997, the INDC strongly recommended that the Nuclear Data Section support new measurements and update the database on Neutron-induced Prompt Gamma-ray Activation Analysis (21st INDC meeting, INDC/P(97)-20).

As a consequence of the various recommendations, a CRP on "*Development of a Database for Prompt Gamma-ray Neutron Activation Analysis (PGAA)*" was initiated in 1999. Prior to this project, several consultants had defined the scope, objectives and tasks, as approved subsequently by the IAEA. Each CRP participant assumed responsibility for the execution of specific tasks. The results of their and other research work were discussed and approved by the participants in research co-ordination meetings (see Summary reports: INDC(NDS)-411, 2000; INDC(NDS)-424, 2001; and INDC(NDS)-443, 2002).

PGAA is a non-destructive radioanalytical technique, capable of rapid or simultaneous "in-situ" multi-elemental analyses across the entire Periodic Table, from hydrogen to uranium. However, inaccurate and incomplete data were a significant hindrance in the qualitative and quantitative analysis of complicated capture-gamma spectra by means of PGAA. Therefore, the main goal of the CRP was to improve the quality and quantity of the required data in order to make possible the reliable application of PGAA in fields such as materials science, chemistry, geology, mining, archaeology, environment, food analysis and medicine. This aim has been achieved thanks to the dedicated work and effort of the participants. An IAEA TECDOC is in press, and the CD-ROM included with this publication contains the database, the retrieval system, the three Certified Reference Material (CRM) reports, and other important electronic documents related to the CRP. LBNL played the leading role in the development of the CRP and the compilation, analysis, and provision of the adopted data for the database.

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