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Implementation of the k0-standardization method for analysis of geological samples at the Neutron Activation Analysis Laboratory, São Paulo, Brazil

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The Neutron Activation Analysis Laboratory (LAN-IPEN) has been analysing geological samples for many years with INAA comparative method, for geochemical and environmental studies. This study presents the results obtained in the implementation of the k0 standardization method at LAN-IPEN, for geological samples analysis, by using the program k0-IAEA, provided by The International Atomic Energy Agency (IAEA). The efficiency curve of the gamma-ray spectrometer used was determined by measuring calibrated radioactive sources at the commonly used counting geometries. The thermal to epi-thermal flux ratio f and the shape factor α of the epi-thermal flux distribution of the IEA-R1 nuclear reactor of IPEN were determined for the pneumatic irradiation facility and some selected irradiation positions, for short and long irradiation, respectively. To obtain these factors, the “bare triple-monitor” method with ^{197}Au - ^{96}Zr - ^{94}Zr was used. The Certified Nuclear Reference Material IRMM-530R Al-0,1% Au alloy, high purity zirconium, Ni and Lu comparators were irradiated. In order to validate the methodology, the geological reference materials basalts JB-1 (GSJ) and BE-N (IWG-GIT), andesite AGV-1 (USGS), granite GS-N (IWG-GIT), SOIL-7 (IAEA) and sediment Buffalo River Sediment (NIST-BRS-8704), which represent different geological matrices, were analysed. The concentration results obtained agreed with certified, reference and recommended values, with relative errors less than 10% for most elements. These results indicate excellent possibilities of using this parametric method at the LAN-IPEN for geochemical and environmental studies.

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