

On uncertainties in the manganese sulphate bath techniques

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The manganese sulphate bath is a globally recognized method for determining emission of neutrons from radionuclide sources. In combination with the measurement of neutron emission anisotropy this method is standardly used for primary standardization of dosimetry quantities of neutron radiation. To achieve results at the metrology level it is necessary to have all quantities which contribute to the overall uncertainty properly determine and contributing uncertainties minimized. Therefore, this paper is focused on the quantification of the possible sources of the uncertainties. The measurement system is characterized by external circuit and primarily used in continual mode. The system consists of the spherical shaped plexiglass bath vessel with a dry channel, where the neutron source is placed during measurement, and forced circuit with a special Marinelli beaker equipped by the 76x76 mm cylindrical NaI(Tl) gamma detector. The circulation time of the manganese solution is also not negligible during continual measurement of the activity. For validation purposes the specific activity measurement can be performed for samples extracted from the front and the back side of the Marinelli beaker. Sample measurements, which is also case of the static measurement, is performed by high purity germanium detector (HPGe). In previous analyses the final uncertainty of neutron emission rate was less than 1 %, which was considered as a target value. Nevertheless, the relative change from reference values was relatively high and out of this uncertainty. Calculated neutron emission rates were in the range of ± 10 % according to used neutron source. This relative change raised questions about the accuracy of other contributed parameters, like volume of the vessel, concentration of MnSO_4 measurement evaluation method or computational model. Therefore, the main part of this paper focuses on determination and re-evaluation of these parameters with corresponding uncertainties.

Přihlásit do soutěže

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