

INTERNATIONAL STANDARD

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Requirements for representative sampling of uranyl nitrate solutions for the determination of uranium concentration

*Exigences pour obtenir un échantillonnage représentatif de solutions de
nitrate d'uranyle en vue de déterminer la concentration d'uranium*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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Requirements for representative sampling of uranyl nitrate solutions for the determination of uranium concentration

1 Scope

This International Standard specifies essential precautions to be taken to ensure that installed tank mixing and sampling systems produce samples from a batch of pure uranyl nitrate solution which are representative, and that the samples remain representative until used.

When the requirements given in this International Standard are applied, the difference between the uranium concentration of the samples, taken from the batch, and the average concentration of uranium in the solution is less than 0,2 %.

2 General

Because uranium processing plants vary in design, process and equipment, uniform procedures for sampling uranyl nitrate storage tanks cannot be established. However, certain guidelines may be applied to all sampling systems.

Representative samples are a fundamental necessity for accurate measurement of uranyl nitrate solutions. Some chemical and physical properties of uranyl nitrate solutions and their containers make representative sampling difficult or impossible, for example:

- a) Solutions may be stored in tanks with a critically safe and therefore complex geometry. Prolonged mixing times are then required to achieve mixing of the total volume.
- b) High density and viscosity, particularly at the high uranium concentrations, make prolonged mixing times necessary to achieve a homogeneous tank content.

- c) The possible presence of a second phase, either crystallized uranium, organic liquids or solids, impedes representative sampling.

Many of these problems can be avoided or controlled by effective engineering at the design stage. Nevertheless, a mixing and sampling procedure shall be established for each tank and representativeness of samples shall be experimentally verified. After any modification of the equipment, these procedures shall be validated again.

The samples taken shall be handled and stored in such a way that their properties at the time of chemical analysis can reliably be related to those properties at the time of sampling. Changes can occur in the samples themselves, for example uranyl nitrate solutions can crystallize (depending on uranium concentration, free acidity and temperature). Handling and storage procedures shall be designed to minimize any changes of sample properties between sampling and analysis, or at least to allow for corrections when changes are unavoidable.

3 Tank mixing and sampling

The following steps should be applied to reduce systematic and random sampling errors to a tolerably low level.

3.1 The uranyl nitrate solution should be thoroughly homogenized in accordance with a fixed and verified mixing procedure, to ensure that the solution is isotopically, chemically and physically uniform.

Procedures should be verified for each tank. Documentation of mixing and sampling studies should be maintained on file as long as the system is in use, in accordance with the ISO 9000 series.