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Analytical Procedures Developed by the IAEA's ALMERA Network Applicable to the Characterization of Legacy Nuclear Test Sites

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IAEA'S ALMERA NETWORK

❑ The IAEA's network of **Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA)**, consisting in June 2017 of 160 laboratories in 87 countries, has for aim to provide **timely and reliable measurement results of environmental radioactivity** in routine monitoring and emergency situations.

❑ The IAEA supports the ALMERA laboratories in their environmental radioactivity monitoring activities by organizing:

(i) **Proficiency test and inter-laboratory comparison exercises**;

(ii) Collaborative development and validation of **analytical procedures for environmental radioactivity measurement**;

(iii) **Training courses and training workshops**.

RAPID METHODS FOR CHARACTERIZATION OF LEGACY NUCLEAR TEST SITES

❑ The **characterization of legacy nuclear test sites** in terms of radionuclide levels and distributions is important for obtaining **information on the respective nuclear tests and their impacts**, as well as for environmental rehabilitation purposes.

❑ **ALMERA tested and validated analytical procedures** are essential tools for the production of **reliable and comparable environmental radioactivity measurements** in such cases [1].

❑ In addition to routine sequential procedures, **rapid procedures** have been developed and validated:

(i) for the rapid **determination of Pu isotopes and ^{241}Am in soil and sediment samples** [2];

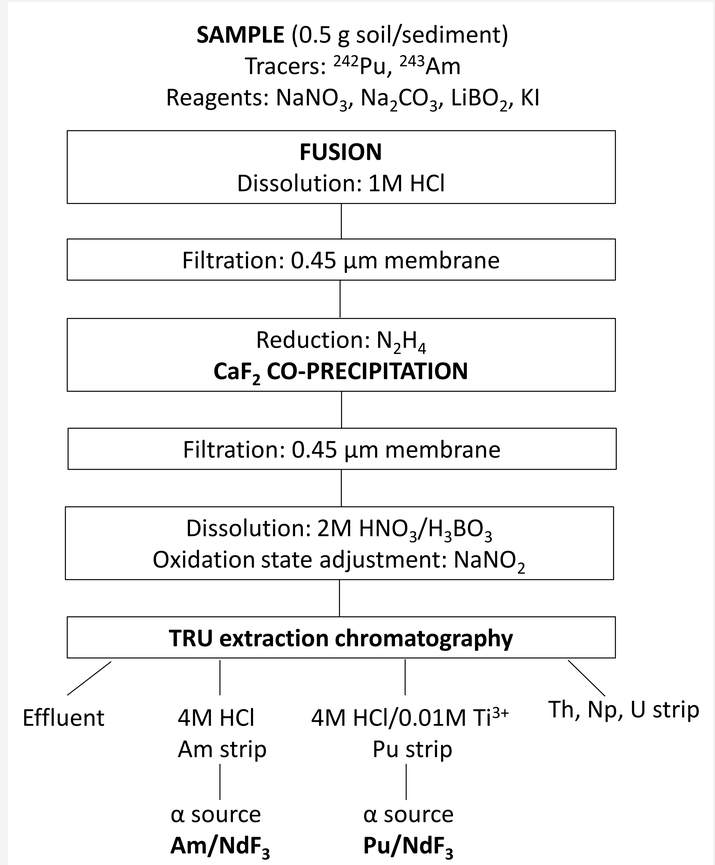
(ii) for the rapid simultaneous **determination of ^{89}Sr and ^{90}Sr in milk** [3];

(iii) for the rapid simultaneous **determination of ^{89}Sr and ^{90}Sr in soil samples**;

(iv) for the rapid simultaneous **determination of ^{89}Sr and ^{90}Sr in seawater samples**.

CHARACTERISTICS OF THE RAPID METHOD FOR PU AND AM DETERMINATION IN SOIL

Flowchart of the rapid procedure for Pu and Am determination in soil



❑ **Straightforward method** (no complex step);

❑ **Rapid method** (results within 24 hours during an emergency situation)

- ❑ Whole procedure: within 7-8 hours;
- ❑ Overnight counting of the alpha sources.

❑ **High chemical recoveries**: 60-80% for Pu; 80-95% for Am.

❑ **Effective removal of interferences**;

❑ **Low limits of detection**: 1.2 Bq/kg for $^{239+240}$Pu.

TRAINING COURSES ON RAPID METHODS

❑ Training courses on rapid assessment procedures for environmental radioactivity are also regularly organized to reinforce the analytical skills of the ALMERA laboratories' personnel, who are interested in **enhancing their rapid response capabilities in case of a radiological emergency event**.

❑ The **practice in the laboratory** of a rapid analytical procedure validated by the ALMERA laboratories and published by the IAEA is a **key element of such training courses**.

❑ All developed and validated ALMERA analytical procedures are **available free of charge** as pdf files under the following link:

https://nucleus.iaea.org/rpst/ReferenceProducts/ALMERA/Validated_analytical_methods/index.htm

❑ Rapid procedures allow **high sample throughput for large-scale or high-resolution site characterization**.

■ **REFERENCES**:

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3. IAEA (2013), Rapid Simultaneous Determination of ^{89}Sr and ^{90}Sr in Milk: A Procedure Using Cerenkov and Scintillation Counting. IAEA Analytical Quality in Nuclear Application Series No. 27. Vienna.