

Uranium Fission Products Proficiency Test Samples and Calibrated Standards

Eckert & Ziegler Analytics (EZA) has a well-established cross check program that provides a wide range of radioactive proficiency test samples for environmental and effluent monitoring on a quarterly basis. We now prepare fresh uranium fission products in a variety of sample types to support work in research, global fall-out monitoring, emergency preparedness and proficiency testing.

- The fresh fission product mixture is produced from irradiation of 'Natural Uranium' or 'Enriched Uranium' with thermal neutrons.
- The analysis of this fission mixture provides a challenging and valuable tool for training and proficiency testing.

Our fission mixture (FM) contains the same array of radionuclides as expected in post-accident samples.

- It contains over 18 isotopes with reasonable half-lives – *Table 1*.
- As a proficiency test option, our customers will be required to quantify 13 nuclides as listed in *Table 2*.
- Nuclides with very short half-lives like I-132 and Tc-99m are decay products with their parent nuclides present in the mixture.

If required, activation products like Co-60 can be added.

- At the time of delivery the activities of all nuclides will be well above background levels.
- With liquid fission mixture samples, laboratories can test their ability to handle samples prior to their analysis. There are several variables including sample containers, solution preservation and storage conditions that can alter the analytical results significantly.
- Analysis of fission samples will help laboratories improve their performance and proficiency in gamma spectrometry analysis.

This nuclide mixture has been successfully used internationally in government supported proficiency testing programs.

- EZA is committed to working with our customers, providing high quality feedback.
- FM samples can be provided as liquid samples, filters, simulated filters, soil, vegetation, and charcoal cartridges.

Table 1
List of significant nuclides present in the FM

Nuclide	T _{1/2}	Nuclide	T _{1/2}
Mo-99	2.75 d	Te-132	3.26 d
Tc-99m	6.02 h	Cs-134	2.06 y
Nb-95	35.2 d	Cs-137	30.0 y
Zr-95	63.98 d	Ba-140	12.74d
Ru-103	39.4 d	La-140	1.68 d
Ru-106	1.01 y	Ce-141	32.5 d
Sb-125	2.73 y	Ce-143	33.0 h
I-131	8.04 d	Ce-144	284.9 d
I-132	2.29 h	Nd-147	11.0 d

Table 2
List of Nuclides to be quantified

Nuclide	T _{1/2}	Nuclide	T _{1/2}
Zr-95	63.98 d	Cs-137	30.0 y
Nb-95	35.2 d	Ba-140	12.74d
Mo-99	2.75 d	La-140	1.68 d
Tc-99m	6.02 h	Ce-141	32.5 d
Ru-103	39.4 d	Ce-144	284.9 d
Te-132	3.26 d	Nd-147	11.0 d
I-132	2.29 h		

Established fresh fission mixture product sample types:

1. Solutions	2. Filter	3. Compressed Filter	4. Soil and Vegetation
Proficiency Test (PT) samples and Calibrated Standards, NIST traceable	PT samples and calibrated standards, NIST traceable	PT samples and calibrated standards, NIST traceable	PT samples and calibrated standards, NIST traceable
Acidified solutions	47 mm diameter, tape on tape, active diameter 45 mm	a. 50 mm diameter x 6 mm height	Activity range 20 kBq - 200 kBq total activity
Nominal 5 ml, 10 ml, 20 ml and 30 ml	Other dimensions, up to 100 mm diameter, are available	b. 70 mm diameter x 6 mm height	The calibrated nuclides are listed in Table 2.
Activity range 20 kBq - 200 kBq total activity	Activity range 20 kBq - 200 kBq total activity	Activity range 20 kBq - 200 kBq total activity	
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We are planning an irradiation in the fall of 2018 depending on demand. Please contact us for details and to discuss your specific requirements.

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