Gross beta and residual beta analysis - CIEMAT

Gross beta and residual beta analysis

Measurement	Proportional counter
Method used for matrices	Environmental Water Terrestrial Air (particles) Biological
Separation Method	Spontaneous deposition other
Radionuclide(s)	Gross beta Residual beta
Quantity for continental water (l)	0.1
Quantity for sea water (l)	0.004
Quantity for biological and mineral samples (kg - dry ashes)	0.0002
Quantity for air samples (l)	600 000
Counting time for the method - general (s)	60 000
Counting time for environmental air (s)	18 000
MDA for continental water - gross beta	0.02 Bq/l
MDA for sea water - gross beta	1 Bq/l
MDA for continental water - residual beta	0.03 Bq/l
MDA for sea water - residual beta	3 Bq/l

MDA for biological and mineral samples	0.7 Bq/kg
MDA for environmental air	0.03 Bq/l
Method Evaluated	Yes
Method Accredited	Yes

Gross beta and residual beta in water

Water sample is evaporated on stainless steel planchets until complete dryness.
Potassium is determined by atomic emission spectrometry.

Gross beta in biological and mineral samples

200 mg of ashed sample is weighed in a stainless steel planchet. Some drops of distilled water are added for fixation of the sample.

Gross beta for environmental air

Filter is placed in a Stainless Steel planchet and measured in the counter.

For further information please, contact to:

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Gross beta counting in water

Go to the begining

Gross beta counting in water

Gross beta counting in water

Sample preparation

To determine Gross Beta Activity and Residual Beta Activity, waters are not filtered, unless samples contain too much suspended matter. In that case a 45 µm pore size filter is used. In this case activity is determined both: in filtered water and in matter retained in the filter.

Size of the sample

For inland waters and drinking water, the size of the sample is determined as a function of the weight of solid residue. For this determination 50 mL of sample are taken in a beaker, is taken to dryness in an oven at 180 ºC, weight of residue is determined and volume of the sample is determined in order to achieve a total residue of aroung 100-150 mg.

For seawater the volume to be used is 4 mL.

Process

1. For inland water samples and drinking water pour the sample into a beaker properly identified with the reference of the sample. For seawater samples, go to step 4.
2. Verify with PH paper that the inland water samples and drinking waters are acidified to pH 1 - 4. Seawater should not be acidified.
3. Evaporate the sample on a heating plate not allowing reaching to boiling up to a volume of about 3 to 10 mL.
4. Clean stainless steel planchet, of 5 cm diameter , with alcohol.
5. Identify the plachet with the appropriate reference and weigh it (P_1).
6. Transfer the sample over the planchet and evaporate it under an infrared lamp.
7. Wash the beaker with a small amount of deionized water acidified with nitric acid and transfer it to the planchet.
8. Wait for the residue in the planchet to completely evaporate to dryness.
9. Dry in oven at 180 ° C (approx.) for at least 12 hours.
10. Place planchets in a desiccator and wait at least two days to counting.
11. Weigh the planchet with the residue (P_2).
12. Calculate the net weight of the deposit (P_1-P_2) to determine the self-absorption factor.

Figure 1.- Evaporation of samples in planchets under infrared lamps.

Measurement time

1000 minutes

Blank sample

They are prepared with the same method as problem samples with 100 mL of deionized water.

In this case 2000 minutes are used as measurement time.

Standard

For calibration, standards of $^{90}Sr/^{90}Y$ with an approximate activity of 80 Bq, deposited in 5 cm diameter stainless steel planchets, are used.

In this case a measurement time of 15 minutes is used.

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