



Naturally Occurring Radioactive Materials Analysis

Naturally Occurring Radioactive Materials (NORM) are naturally found in the environment, containing radioactive elements such as uranium, thorium and potassium.

Activities such as mining, extraction, production or processing of rare earth elements can increase the concentration – and therefore radioactivity – of these substances. These are classed as Type 2 NORM industrial activity by the Environmental Permitting Regulations 2010.

With increased potential for radioactive exposure, employers must take action to restrict radiation exposure of their employees and other persons who may be affected under the Ionising Radiations Regulations 2017 (IRR17).

To support regulatory compliance, SOCOTEC is well-equipped to measure radiation levels, detect radioactivity as well as provide full radiochemical analysis so clients can ensure sufficient radiation protection is in place.

With a wealth of experience in analysing NORM for the Oil & Gas, Marine, Mining and Waste sectors, SOCOTEC can support in:

- > Detecting low limits of radiation (between 0.1 to 10 Bq/kg)
- > Verifying compliance with NORM regulations
- > Comparing detection limits
- > Characterising decommissioning
- > Testing for Waste Acceptance Criteria (WAC)
- > In-house radiochemical and chemical analysis for:
 - Soils
 - Waters
 - Concretes/aggregates
 - Metals
 - Oils
 - Solid waste

DETECTING RADIATION

Radiation is measured by counting the number of interactions that the Alpha, Beta or Gamma radiation has with matter, material, or the radiation detector.

Both Alpha and Beta techniques require separation of the element and a pure preparative is prepared. Low limits can be detected (between 0.1 to 10 Bq/kg) for all techniques, as well as identifying the radionuclide.

ANALYTICAL METHODS

Radioactive decay in Thorium and Uranium commonly form the list of isotopes that contribute to natural radiation. Using analytical methods, including Alpha Spectrometry, Beta counting and Gamma Spectrometry, SOCOTEC can detect radionuclides including:

- > Uranium: ^{234}U , ^{235}U , ^{238}U
- > Thorium: ^{232}Th , ^{228}Th , ^{230}Th , ^{234}Th
- > Radium: ^{226}Ra , ^{228}Ra , ^{224}Ra (special due to its short half-life)
- > Actinium: ^{228}Ac
- > Lead: ^{210}Pb , ^{212}Pb , and associated bismuth isotopes
- > Polonium: ^{210}Po

SOCOTEC's techniques include:

Gamma spectrometry

- > Widely used to determine a range of radionuclides from the NORM decay series
- > Non-destructive, although for a precise measurement the sample material is grinded
- > Analysis is fast and results can be delivered in 24 hours for very urgent samples. Standard delivery time is 10 working days
- > Very often used as initial scan to determine the requirement for other analyses

Alpha spectrometry

- > Widely used to determine specific alpha emitting radionuclides
- > Radiochemical separation required, but a total actinide isolation can be carried out as well, giving semi-quantitative information of alpha emitters potentially present in your samples
- > Sample preparation and analysis can take between 5-15 days

Gas proportional counting

- > Widely used to determine gross alpha and gross beta radiation
- > Can be calibrated for a specific radionuclide

Liquid scintillation counting

- > Widely used to determine beta radiation
- > Only used for a specific radionuclide (radiochemical separation required)

FOR MORE INFORMATION

For more information about SOCOTEC's services, please contact salesuk@socotec.com or call 0845 603 2112.