



Canadian Nuclear Safety Commission

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Radiation Safety Data Sheet

This data sheet presents information on radioisotopes only.

For information on chemical compounds incorporating this radionuclide, see the relevant Material Safety Data Sheet.

Part 1 - RADIOACTIVE MATERIAL IDENTIFICATION

Chemical Symbol:	Th	Common Names:	Thorium
Atomic Weight:	232	Atomic Number:	90

Note: There will always be some ²²⁸Th and a variable amount of ²²⁸Ra present in ²³²Th.

Part 2 - RADIATION CHARACTERISTICS

Physical Half-Life: 1.405 × 10¹⁰ years

CNSC Exemption Quantity (in Bq): 100

A CNSC license is not required if the amount of radioactive nuclides possessed is less than one Exemption Quantity.

Principal Emissions	Average Energy (MeV)**	Maximum Energy (MeV)***	Dose Rate at 1m Distance (mSv/h·GBq)	Recommended Shielding
Neutrons		-	-	-
Gamma & X-rays	0.059	-	0.0185	-
Beta*	-	-	-	-
Alpha	4.010	-	-	-

* Where beta radiation is present, bremsstrahlung radiation will be produced. Shielding may therefore be required.

** Average energy of most abundant emission.

*** Maximum of most abundant emission.

Progeny	Ra-228(5.75 y), Ac-228(6.13 h), Th-228(1.9131 y), Ra-224(3.66 d), Rn-220(55.6 s), Po-216(0.15 s), Pb-212(10.64 h), Bi-212(60.55 m), Po-212(0.305 µs), Tl-208(3.07 m)
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Part 3 – DETECTION AND MEASUREMENT

Method of Detection: ZnS scintillation counter

Dosimetry:

External: TLD (whole body & skin) Extremity Neutron
 Internal: Whole body (Measurement of progeny) Thorax Urine analysis Other (specify) Faeces, ²²⁰Rn in breath, personal air sampler

Part 4 - PREVENTATIVE MEASURES

Thorium and its decay products are toxic by ingestion and inhalation. Thorium is attracted to the bones, lungs, lymphatic glands and parenchymatous tissues. Thorium remains in the body for a long time and is known to cause changes to blood forming, nervous and reticuloendothelial systems, and functional and structural damage to lung and bone tissue. Long after the initial exposure, neoplasms may occur and immunological activity of the body impaired. Always use the principles of time, distance and shielding to minimize dose.

Thorium is flammable and explosive in powder form. Thorium dusts have very low ignition points and may ignite at room temperatures.

No protective clothing is necessary for work with sealed sources. When working with unsealed sources wear appropriate protective clothing, such as laboratory coats (which must be monitored before leaving the laboratory), coveralls, rubber or plastic gloves.

When handling thorium oxide or thorium nitrate take care not to generate dust. Handle unsealed sources in glove boxes. Optimize time, distance and shielding. Laboratory equipment used for radioactive work must not be used for other purposes. Monitor equipment and supplies for loose contamination before removing from laboratory. Use disposable absorbent liners on trays.

Consult CNSC license for requirements concerning engineering controls, protective equipment, and special storage requirements.

Part 5 - ANNUAL LIMIT ON INTAKE

Compound Type	Ingestion		Inhalation	
	Unspecified compounds*	Oxides & hydroxides*	Unspecified compounds*	Oxides, hydroxides*
Annual Limit on Intake (Bq)	7×10^4	2×10^5	4×10^2	5×10^2

Note: * Values are in Bq ^{232}Th activity for intakes of natural thorium, *i.e.*, $^{232}\text{Th} + ^{228}\text{Th}$ in equilibrium.

EMERGENCY PROCEDURES

The following is a guide for first responders. The following actions, including remediation, should be carried out by qualified individuals. In cases where life threatening injury has resulted, **first** treat the injury, **second** deal with personal decontamination.

Personal Decontamination Techniques

- Wash well with soap and water and monitor skin
- Do Not abrade skin, only blot dry
- Decontamination of clothing and surfaces are covered under operating and emergency procedures

Spill and Leak Control

- Alert everyone in the area
- Confine the problem or emergency (includes the use of absorbent material)
- Clear area
- Summon Aid

Emergency Protective Equipment, Minimum Requirements

- Gloves
- Footwear Covers
- Safety Glasses
- Outer layer or easily removed protective clothing
- Suitable respirator selected