

Manganese-54

1. Radioactive Material Identification
Common Names: Manganese-54
Atomic Number: 27
Chemical Form: Soluble
Chemical Symbol: Mn-54 or ⁵⁴ Mn
Mass Number: 54 (33 neutrons)

2. Radiation Characteristics																									
Physical half-life: 312.7 days																									
Specific Activity (GBq/g): 287,000																									
<table border="1"> <thead> <tr> <th>Principle Emissions</th> <th>E^{Max} (keV)</th> <th>E^{eff} (keV)</th> <th>Dose Rate (μSv/h/GBq at 1m)</th> <th>Shielding Required</th> </tr> </thead> <tbody> <tr> <td>Beta* (β)</td> <td>355.2 (10%)</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Gamma (γ) / X-rays</td> <td>835 (100%) 4 (67%) 5 (23%) 6 (3%)</td> <td>-</td> <td>370</td> <td>HVL Lead: 1.2 cm</td> </tr> <tr> <td>Alpha (α)</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Neutron (n)</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Principle Emissions	E ^{Max} (keV)	E ^{eff} (keV)	Dose Rate (μSv/h/GBq at 1m)	Shielding Required	Beta* (β)	355.2 (10%)	-	-	-	Gamma (γ) / X-rays	835 (100%) 4 (67%) 5 (23%) 6 (3%)	-	370	HVL Lead: 1.2 cm	Alpha (α)	-	-	-	-	Neutron (n)	-	-	-	-
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Progeny: Chromium-54 (Cr-54), Iron-54 (Fe-54)																									

3. Detection and Measurement	
Methods of detection (in order of preference):	
1.	A radiation survey meter equipped with an energy-compensated Geiger Mueller detector. (Ludlum)
2.	Ion chamber survey meter - tends to be less sensitive than a Geiger Mueller survey meter but is able to respond more precisely in higher radiation fields. (Fluke)
3.	Gamma scintillation detector- very sensitive but is also energy dependent. Must be calibrated for Co-60 before it can be used for dose assessment surveys.
Dosimetry	
Whole Body	<u> x </u> Skin <u> </u> Extremity <u> </u> Neutron <u> </u>
Internal: Sealed sources pose no internal radiation hazard. However, in the event of loss of containment by the sealed source, all precautions should be taken to prevent inhalation or ingestion of the material.	
Critical Organ(s): Liver, GI Tract, Lung	
Annual Dose Limits: Non-radiation workers: 1 mSv per year Radiation workers: 50 mSv per year, 100 mSv total over five years Pregnant radiation workers: 4 mSv over the balance of the pregnancy	

4. Preventative Measures	
Engineering Controls:	
Personal Protective Equipment: For normal handling of unsealed sources only. Always wear disposable gloves, safety glasses, and whatever personal protective equipment and clothing appropriate to the material handled.	
Special Storage Requirements:	

5. Control Levels		
Oral Ingestion	Inhalation	
ALI (kBq)	ALI (kBq)	DAC (Bq/ml)
74,000 (Class D)	33,300 (Class D) 29,600 (Class W)	0.015 (Class D) 0.011 (Class W)
Exemption Quantity (EQ):	370,000 Bq	

6. Non-radiological Hazards

Prolonged exposure to airborne particles may result in coughing, dyspnea, decreased pulmonary functioning and respiratory hypersensitivity. Confirmed animal carcinogen with unknown relevance to humans.

OSHA Permissible Exposure Limit (PEL):
0.1 mg/m³

7. Emergency Procedures

Personal Decontamination Procedures

- 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

Damage to Sealed Radioactive Source Holder

- Evacuate the immediate vicinity around the source holder
- Place a barrier at a safe distance from the source holder (minimum 5 meters)
- Identify area as a radiation hazard
- Contact emergency number posted on local warning sign

Suggested Emergency Protective Equipment

- Gloves
- Footwear Covers
- Safety Glasses
- Outer layer or easily removed protective clothing (as situation requires)