

SULFUR-35 [³⁵S]

PHYSICAL DATA

- Beta energy:
167 keV (maximum)
53 keV (average) (100% abundance)
- Physical Half Life:
87.4 days
- Biological Half Life:
623 days (unbound ³⁵S)
- Effective Half Life:
44-76 days (unbound ³⁵S)
- Specific Activity:
42,400 Ci/g
- Maximum Beta Range in Air:
26.00 cm. = 10.2 in.
- Maximum Beta Range in Water or Tissue:
0.32 mm. = 0.015 in.
- Maximum Beta Range in Plexiglas or Lucite:
0.25 mm. = 0.01 in.
- Fraction of ³⁵S betas transmitted through dead layer of skin = 12%

RADIOLOGICAL DATA

- Critical organ: Testis
- Routes of Intake: Ingestion, inhalation, puncture, wound, skin contamination (absorption)
- External exposure (deep dose) from weak ³⁵S beta particles is not a radiological concern.
- Internal exposure and contamination are the primary radiological concerns.

SHIELDING

- None required (¾ 3 mm Plexiglas shields; shielding optional)

SURVEY INSTRUMENTATION

- Can detect using a thin window G-M survey meter (pancake), however, probe **MUST** be at close range, recommend 1 cm distance.
- G-M survey meter has low efficiency, usually 4 - 6%.
- Liquid scintillation counter (wipes, smears) may be used for secondary, **but will NOT detect non removable contamination!**

RADIATION MONITORING DEVICES

- (Badges): Not needed, because ^{35}S beta energy is too low, and is not an external radiation hazard
- Dose Rate from a 1 millicurie unshielded isotropic point source of ^{35}S :

<u>Distance</u>	<u>Rad/Hr</u>
1.0 cm	1173.6
2.5 cm	93.7
15.24 cm	0.2
20.00 cm	0.01

GENERAL RADIATION SAFETY INFORMATION

- Urinalysis: Not required, but may be requested after a spill or personnel contamination involving ^{35}S .
- Inherent volatility (STP): **SIGNIFICANT** for ^{35}S methionine and cysteine.
- Radiolysis of ^{35}S amino acids (cysteine and methionine) during storage and use may lead to the release of volatile impurities. Volatile impurities are small ($\frac{3}{4}$ 0.05%).
- Metabolic behavior of organic compounds of sulfur (cysteine and methionine) differs considerably from the metabolic behavior of inorganic compounds.
- Organic compounds of sulfur (cysteine and methionine) become incorporated into various metabolites. Thus, sulfur entering the body as an organic compound is often tenaciously retained.
- The fractional absorption of sulfur from the gastrointestinal tract is typically > 60% for organic compounds of sulfur. Elemental sulfur is less well absorbed from the GI tract than are inorganic compounds of the element (80% for all inorganic compounds and 10% for sulfur in its elemental form). Elemental sulfur is an NRC inhalation Class W (meaning it is retained for weeks in the body).

- Inhalation of the gases SO_2 , COS , H_2S , and CS_2 must be considered. Sulfur entering the lungs in these forms is completely and instantaneously translocated to the transfer compartment; from there, its metabolism is the same as that of sulfur entering the transfer compartment following ingestion or inhalation of any other organic compound of sulfur.
- Contamination of internal surfaces of storage and reaction vessels may occur (rubber stoppers, gaskets or o rings).
- Vials of ^{35}S labeled cysteine and methionine should be opened and used in ventilated enclosures (exhaust hoods).
- The volatile components of ^{35}S labeled amino acids should be opened and used in ventilated enclosures (exhaust hoods).
- The volatile components of ^{35}S labeled cysteine and methionine are presumed to be hydrogen sulfide (H_2S) and methyl mercaptan (CH_3SH), respectively.
- ^{35}S vapors may be released when opening vials containing labeled amino acids, during any incubating of culture or cells containing ^{35}S , and the storage of ^{35}S contaminated wastes.
- Excessive contamination can be found on the inside surfaces and in water reservoirs of incubators used for ^{35}S work. Most notable surface contamination can be found on rubber seals of incubators and centrifuges.
- Radiolytic breakdown may occur during freezing processes, releasing as much as 1.0 μCi of ^{35}S per 8.0 mCi vial of ^{35}S amino acid during the thawing process.
- ^{35}S labeled amino acids work should be conducted in an exhaust hood designated for radiolytic work..
- Vent ^{35}S amino acid stock vials with an open-ended charcoal-filled disposable syringe. Activated charcoal has a high affinity for ^{35}S vapors.
- Place an activated carbon or charcoal canister, absorbent sheet, or tray (50-100 grams of granules evenly distributed in a tray or dish) into an incubator to passively absorb ^{35}S vapors. Discard absorbers which exhibit survey meter readings above normal area background levels in the solid radioactive waste.