

TLD Materials Specifications

Handling and thermal treatment

Consistent, well-controlled and repeatable procedures are the key to successful TLD. Variations in annealing temperature will affect dosimeter sensitivity, for example. The following guidelines are advisable to optimize the reproducibility of bare dosimeters.

Handling

Vacuum tweezers should always be used. (Avoid mechanical tweezers or fingers). Small scratches, loss of mass or foreign deposits affect light emission).

Cleaning

Rinse the dosimeters in analytical grade anhydrous methyl alcohol between normal uses. (Do not soak). Dry by leaving to evaporate for at least one hour. Anneal once before actual use, accurately following the established procedure. The anneal will also assist in removing any residual methyl alcohol.

Annealing

For annealing temperatures up to 400 °C, the containers should be made from high temperature stainless steel or

oxidized aluminum, preferably thin to assist rapid cooling following annealing. (Do not use non-oxidized aluminum). The use of a dedicated annealing oven reduces the risk of contamination by foreign material. Place the annealing containers on open oven racks with air space all round to avoid inconsistent heat gradients. (Do not stack containers or allow them to touch the oven walls).

CAUTION - Sensitivity to Ultraviolet Light

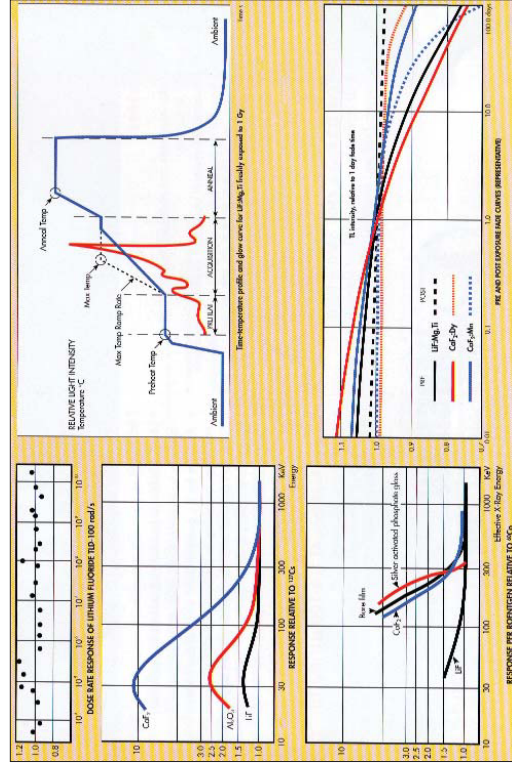
Calcium Fluoride Dysprosium (TLD-200), Aluminum Oxide (TLD-500) and Calcium Sulfate Dysprosium (TLD-900) are extremely sensitive to UV light.

These materials should be handled and used in the absence of UV light and stored in opaque containers.

Calcium Fluoride Manganese (TLD-400) is moderately UV light sensitive.

Limiting temperatures

Temperature	Significance
240 °C	limit for LiF:Mg,Cu,P materials
300 °C	limit for PTFE encapsulation
400 °C	limit for Kapton encapsulation



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Materials and Assemblies for
 Thermoluminescence Dosimetry

Product Overview



System overview

Single element dosimeters and assemblies are widely used in many installations and processed using Harshaw TLD Systems. These systems include a range of Readers and Irradiators with compatible software to implement calibration, radiation evaluation and management, dose algorithms, health physics record keeping, finder database, glow curve analysis and chain of custody monitoring.

Card dosimeters

2, 3 or 4 TLD elements are assembled into rigid aluminum cards and mounted within shielded filter-holders.

EXT-RAD dosimeters

Featuring cold sterilization with efficient handling and processing the System comprises:

- Barcoded 1- or 2-element chipstrate dosimeters
- Adjustable, reusable finger rings with elements in sealed pouches
- Barcoded carrier cards for readout after exposure

DXT-RAD dosimeters

Featuring hot or cold sterilization with fast readout, the System comprises:

- TL100/TL700 disk dosimeters with novel and permanent individual barcodes

- Sealed disposable finger rings - sterilized hot or cold
- Ring sealing and chip extraction
- Carrier cards for readout after exposure

Type	Materials	Secondary Radiation Response	TLF	TLF contains	Sensitivity	Energy	Readout Range	Fading*
		Environmental, Cosmic, medical physics	8.7	3500-6000 Å (4000 mesh)	1.0	1.25	10 µGy-10 Gy	3%/yr at 20 °C corrected
TL10-100H	LiF:Mg,Ti LiF:Mg,Ti LiF:Mg,Cu,P	Environmental, Cosmic, medical physics	8.2	4000 Å	15	0.98	1 µGy-10 Gy	Negligible
TL10-600H	Lithium Fluoride (LiF:Mg,Ti) (LiF:Mg,Cu,P)	Environmental, Cosmic, medical physics	8.2	3500-6000 Å (4000 mesh)	1.0	1.25	10 µGy-10 Gy	3%/yr at 20 °C corrected
TL10-700	Lithium Fluoride (LiF:Mg,Ti) (LiF:Mg,Cu,P)	Environmental, Cosmic, medical physics	8.2	4000 Å	15	0.98	1 µGy-10 Gy	Negligible
TL10-700H	Lithium Fluoride (LiF:Mg,Ti) (LiF:Mg,Cu,P)	Environmental, Cosmic, medical physics	8.2	3500-6000 Å (4000 mesh)	1.0	1.25	10 µGy-10 Gy	3%/yr at 20 °C corrected
TL10-700H	Lithium Fluoride (LiF:Mg,Ti) (LiF:Mg,Cu,P)	Environmental, Cosmic, medical physics	7.4	4000 Å	15	0.98	1 µGy-10 Gy	Negligible
TL10-200	Pyromellitic Acid Diethyl Ester (PMMA)	Environmental, Cosmic, medical physics	16.3	Peaks of 4855 Å	30 at 2765 Å	-12.5	0.1 µGy-10 Gy	10% in 1st 24 hrs, 18% total in 2 wks
TL10-400	Calcium Fluoride (CaF ₂) (CaF ₂ :Dy)	Environmental, Cosmic, medical physics	16.3	Peaks of 4855 Å	10	-13	0.1 µGy-100 Gy	15% in 1st 24 hrs, 15% total in 2 wks
TL10-500	Calcium Fluoride (CaF ₂) (CaF ₂ :Dy)	Environmental, Cosmic, medical physics	10.2	4820 Å	30	2.9	0.05 µGy-1 Gy	35% yr corrected condition
TL10-800	Lithium Borate (Li ₂ B ₄ O ₇) (Li ₂ B ₄ O ₇ :Mn)	High range dominant	7.4	5300-5300 Å (6050 Mesh)	0.15	0.9	0.3 mGy-10 Gy	<5% in 3 months
TL10-900	Calcium Sulfate (CaSO ₄) (CaSO ₄ :Dy)	Environmental	15.5	4800 Å 5700 Å	20	12.5	1 µGy-100 Gy	2% in 1 month 8% in 6 months

Material features

- Available in the form of powders and accurately machined, optically transparent disks, rods, chips and cubes
- Accurate for X-, gamma, beta, electron and neutron radiations according to choice of material
- Simulate "point detector" in medical physics applications
- Reusable hundreds of times
- Independent of dose rate up to 1000 MGy/s
- Long-term response retention
- Powder form only for TLD-900 (CaSO₄:Dy)

Special features of TLD-100 (LiF:Mg,Ti)

- Nearly tissue-equivalent
- ± 15% sample-to-sample uniformity
- Repeatability to within 2% or better

Filter-holder features

- Gasket-sealed to exclude dirt and moisture.
- Polarized to eliminate incorrect card insertion.
- Equipped with tamper-evident seals.
- Provided with visual indication of card barcode ID through window.
- Color-coded, per customer specification; and barcoded if so specified.

Configuration	Position	Purpose	Filler	Radiation Fields & Mixtures β, γ, β + γ	Measurement Range
1	Deep dose	Deep dose	ABS: 600 mg/cm ² or 1000 mg/cm ²	LiF:Mg,Ti or LiF:Mg,Cu,P	10 µGy-20 Gy 1 µGy-20 Gy
3	Energy Discriminator Skin dose	Energy Discriminator Skin dose	ABS + Capote equiv. valent: 335 mg/cm ² Mylar: 17 mg/cm ²	LiF:Mg,Ti LiF:Mg,Ti or LiF:Mg,Cu,P	10 µGy-20 Gy 50 µGy-20 Gy 5 µGy-20 Gy
4	Lens-of-eye dose Neutron discriminator	Lens-of-eye dose Neutron discriminator	ABS: 300 mg/cm ² or 600 mg/cm ² ABS: 600 mg/cm ² or 1000 mg/cm ²	LiF:Mg,Ti or LiF:Mg,Cu,P — —	10 µGy-20 Gy 1 µGy-20 Gy — —

EXT-RAD dosimeters



DXT-RAD dosimeters



Card dosimeters

