

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).

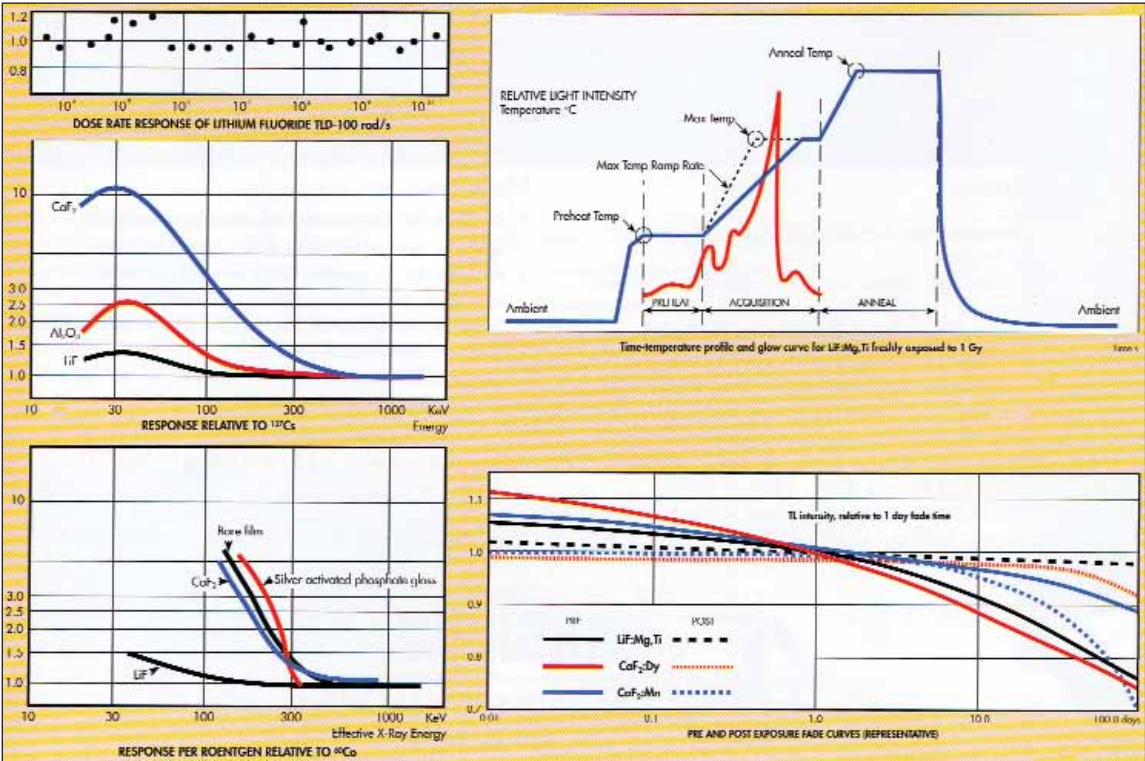
CAUTION - Sensitivity to Ultraviolet Light

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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Worldwide
Frauenauracher Strasse 96
D 91056 Erlangen, Germany
+49 (0) 9131 909-0
+49 (0) 9131 909-205 fax

United Kingdom
Bath Road, Beenham,
Reading RG7 5PR United Kingdom
+44 (0) 118 971 2121
+44 (0) 118 971 2835 fax

United States
27 Forge Parkway
Franklin, MA 02038 USA
+1 (508) 520-2815
+1 (800) 274-4212 toll-free
+1 (508) 428-3535 fax

www.thermo.com/rmp

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Product Overview

Materials and Assemblies for
Thermoluminescence Dosimetry

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:

- TL-100/TL-700 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	Dosimetry applications	Zeff*	TL emission spectra	Sensitivity at ⁶⁰ Co relative to LiF	Energy response 30 keV/ ⁶⁰ Co**	Useful Range	Fading**
TL-100	Lithium Fluoride (Li natural) LiF:Mg,Ti	Health and medical physics	8.2	3500-6000 Å (4000 max)	1.0	1.25	10 µGy-10 Gy	5%/yr at 20 °C corrected
TL-100H	Lithium Fluoride (Li natural) LiF:Mg,Cu,P	Environmental, Personnel, Extremity	8.2	4000 Å	15	0.98	1 µGy-10 Gy	Negligible
TLD-600	Lithium Fluoride (⁶ Li isotope) LiF:Mg,Ti	Neutron	8.2	3500-6000 Å (4000 max)	1.0	1.25	10 µGy-10 Gy	5%/yr at 20 °C corrected
TLD-600H	Lithium Fluoride (⁶ Li isotope) LiF:Mg,Cu,P	Neutron	8.2	4000 Å	15	0.98	1 µGy-10 Gy	Negligible
TL-700	Lithium Fluoride (⁷ Li isotope) LiF:Mg,Ti	Gamma, Beta	8.2	3500-6000 Å (4000 max)	1.0	1.25	10 µGy-10 Gy	5%/yr at 20 °C corrected
TDL-700H	Lithium Fluoride (⁷ Li isotope) LiF:Mg,Cu,P	Gamma, Beta Environmental	7.4	4000 Å	15	0.98	1 µGy-10 Gy	Negligible
TLD-200	Calcium Fluoride Dysprosium CaF ₂ :Dy	Environmental	16.3	Peaks at 4835 Å	30 at 5765 Å	-12.5	0.1 µGy-10 Gy	10% in 1st 24 hrs 16% total in 2 wks
TL-400	Calcium Fluoride Manganese CaF ₂ :Mn	Environmental and high dose	16.3	4400-6000 Å (5000 Max)	10	-13	0.1 µGy-100 Gy	8% in 1st 24 hrs 12% in 3 months
TL-500	Aluminium Oxide Al ₂ O ₃ :C	Environmental	10.2	4200 Å	30	2.9	0.05 µGy-1 Gy	3%/yr optimised condition
TLD-800	Lithium Borate Manganese Li ₂ B ₄ O ₇ :Mn	High range dosimetry	7.4	5300-6300 Å (6050 Max)	0.15	0.9	0.5 mGy-10 ³ Gy	<5% in 3 months
TLD-900	Calcium Sulphate Dysprosium, 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			Radiation Fields & Mixtures		Measurement Range
Position	Purpose	Filter	β, γ, β + γ	β, γ, n, β+γ+n	
1	Deep dose	ABS: 600 mg/cm ² or 1000 mg/cm ²	LiF:Mg,Ti or LiF:Mg,Cu,P	⁷ LiF:Mg,Ti or ⁷ LiF:Mg,Cu,P	10 µGy-20 Gy 1 µGy-20 Gy
3	Energy Discriminator	ABS + Copper equivalent: 333 mg/cm ²	LiF:Mg,Ti	⁷ LiF:Mg,Ti	10 µGy-20 Gy
	Skin dose	Mylar: 17 mg/cm ²	LiF:Mg,Ti or LiF:Mg,Cu,P	⁷ LiF:Mg,Ti or ⁷ LiF:Mg,Cu,P	50 µGy-20 Gy 5 µGy-20 Gy
4 or	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 —	— ⁶ LiF:Mg,Ti or ⁶ LiF:Mg,Cu,P	10 µGy-20 Gy 1 µGy-20 Gy —

EXT-RAD dosimeters



DXT-RAD dosimeters



Card dosimeters

