Thermoluminescence Dosimetry System

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Medical Physics Laboratory I

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Contents

1 | Objective

- To study the characteristics of CaSO4: Dy.
- To calibrate the TL/OSL research Reader in terms of absorbed dose and find out the unknown dose from a sample.

2 | Apparatus

- Annealed TLD samples (CaSO4: Dy)
- Slab phantoms
- TL/OSL Research reader
- TLD Annealing Oven
- Radiation-generating equipment

3 | Theory

4 | Observation

Table 4.1: Intensity values for different doses

Dose (Gy)	A	B	C	D	E	Net Intensity
Background	842326	8401365	7377735	1443072	12047312	0
0.5	42366729	46893479	36180595	48441922	54392237	39632630.4
1	72423155	80360004	73245158	82007274	73189478	70222651.8
2	94610261	93586371	99646954	94782233	91800276	88862857
3	97315644	10255814	110922831	111687756	108736283	100221763.6
4	118198629	117279687	121895156	112600457	117156973	111403818.4
6	129900901	129918209	134048179	127953661	126380141	123474018.2
Unknown A	105077687	107876926	107610287	99717134	104853017	99004648.2
Unknown B	119925678	120381880	116170288	118524838	120983219	113174818.6

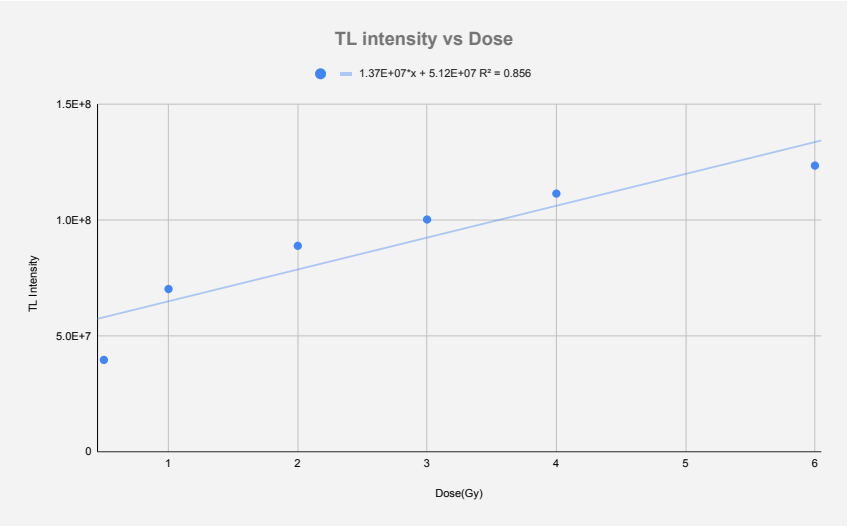

Figure 4.1: Dose vs Average Intensity graph for CaSO4: Dy TLD.

From the graph, we can see that the relationship between dose and intensity is linear. Using the linear fit equation, we can calculate the unknown doses. Using the linear fit equation:

$$\boxed{\text{Dose} = \frac{I - 5.12 \times 10^7}{1.37 \times 10^7}}$$

Where I = Intensity. So for unknown A: the intensity is 99004648.2

$$\text{Dose} = \frac{99004648.2 - 5.12 \times 10^7}{1.37 \times 10^7} = \boxed{3.489}\ \text{Gy}$$

Similarly, for unknown B: the intensity is 113174818.6

$$\text{Dose} = \frac{113174818.6 - 5.12 \times 10^7}{1.37 \times 10^7} = \boxed{4.524}\ \text{Gy}$$

So the relative errors in the calculated doses are: For unknown A:

4.1 | Heating rate analysis

Table 4.2: Intensity values for different doses

Heating rate(°C/s)	A	B	C	Bg A	Bg B	Net Intensity
1	128731197	156087955	130975226	4211945	28177825	122403241
1.5	91896493	106535449	111177232	5737988	34929935	82869096.5
2	97266471	77432993	109717659	17155082	2693598	84881367.67
2.5	93535507	81280319	87006715	15384092	23027192	68068538.33
3	88523949	75226109	72113909	7197779	16678551	66683157.33
4	69037517	63641046	65486040	69037517	307269	31382474.67

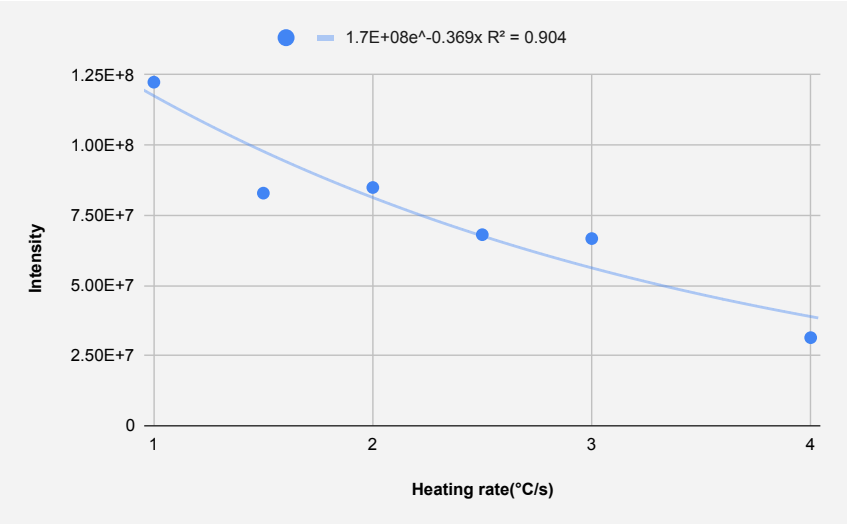

Figure 4.2: Average Intensity graph for CaSO4: Dy TLD vs Heating rate

5 | Conclusion

6 | References