AIM: to get familiar with the Linearly Modulated OSL (LM-OSL) signal and check the behavior of the LM-OSL measurements versus various stimulation parameters.

Materials: Aluminum oxide (TLD 500, Al_2O_3:C) or Berilium oxide (BeO) or quartz

PROTOCOL:

Step 1. Irradiation (1 Gy)

Step 2. TL measurement (350 °C for synthetic materials, 500 °C for natural materials, HR=1 °C/s)

Step 3. Irradiation (1 Gy)

Step 4. LM- OSL measurement (Room temperature, 0% - 90% intensity, 200 s)

Step 5. TL measurement (350 °C for synthetic materials, 500 °C for natural materials, HR=1 °C/s) after OSL.

Step 6. Repeat steps 3-5 for various measurement temperatures (40 °C, 50 °C, 60 °C, 70 °C, 80 °C, 90 °C and 100 °C).

Step 7, Repeat steps 3-5 for various stimulation times (100s, 500s and 1000 s).

Step 8. Repeat steps 3-5 for (Room temperature, 50% - 90% intensity, 500 s).

Step 9. Repeat steps 3-5 for (Room temperature, 50% - 90% intensity, 100 s).

Step 10. Repeat steps 3-5 for (Room temperature, 0% - 50% intensity, 500 s).

Step 11. Repeat steps 3-5 for (Room temperature, 0% - 50% intensity, 100 s).

Analysis:

1. Check the shape of the LM-OSL curves for various parameter equations
2. For each case estimate the Imax and tmax and plot them versus the parameter that changes value.
3. For each case calculate the photo-ionization cross section of the main OSL component.
4. Check the impact of the LM-OSL measurements to the TL glow curve.

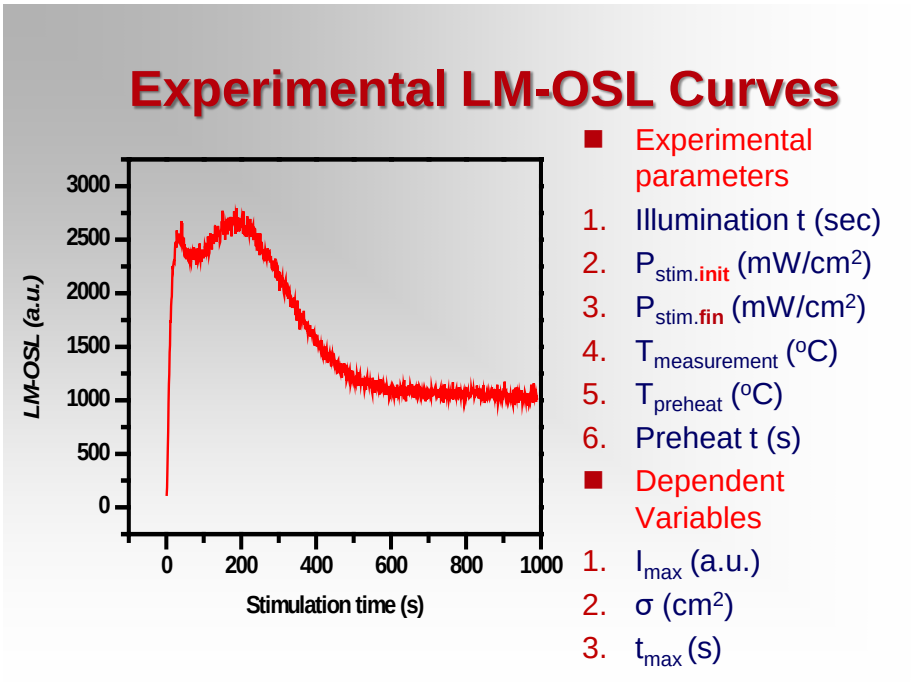

Fig. 1: Experimental parameters and dependent variables in LM-OSL measurements.

$$\sigma = \frac{2P}{c_f \cdot I_0 \cdot u_m^2 (\beta + 1)}. \quad (8)$$

For the stimulation light intensity expressed in W/cm^2 one obtains

$$c_f = \frac{\text{Joule}}{\text{s cm}^2} = \frac{6.24146 \times 10^{18}\ \text{eV}}{\text{s cm}^2}. \quad (9)$$

For a given stimulation photon energy E_ϕ

$$c_f = \frac{6.24146 \times 10^{18}}{E_\varphi} \quad \left[\frac{\text{eV}}{\text{eV s cm}^2}\right]. \quad (10)$$

Eventually

$$\sigma = \frac{2P \cdot E_\varphi}{6.24146 \cdot 10^{18} \cdot u_m^2 I_0 \cdot (\beta + 1)}. \quad (11)$$

Total measurement time

Time corresponding to maximum intensity

Maximum stimulation intensity in W/cm^2

Fig. 2: Methodology for the calculation of the photo-ionization cross section.