



Investigation of the Quenching Concentration of Europium in Photoluminescent Lanthanum Zirconate

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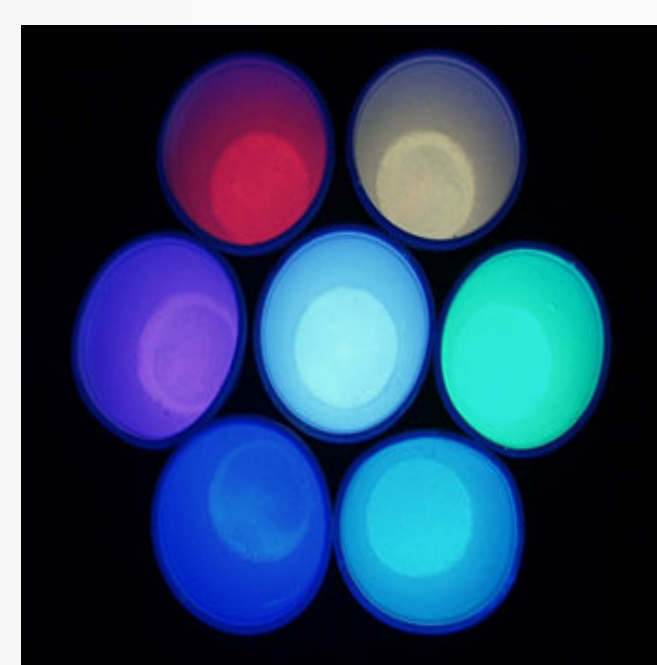
Introduction

What is a Phosphor?

- A ceramic that is designed to fluoresce when excited by high intensity light.
- Inorganic phosphors consist of two components: a host inorganic compound and an activator (or doping agent) from which light is emitted.
- In my case the doping agent is Europium (Eu) and the inorganic compound is Lanthanum Zirconate (LAZ).

What is Luminescence?

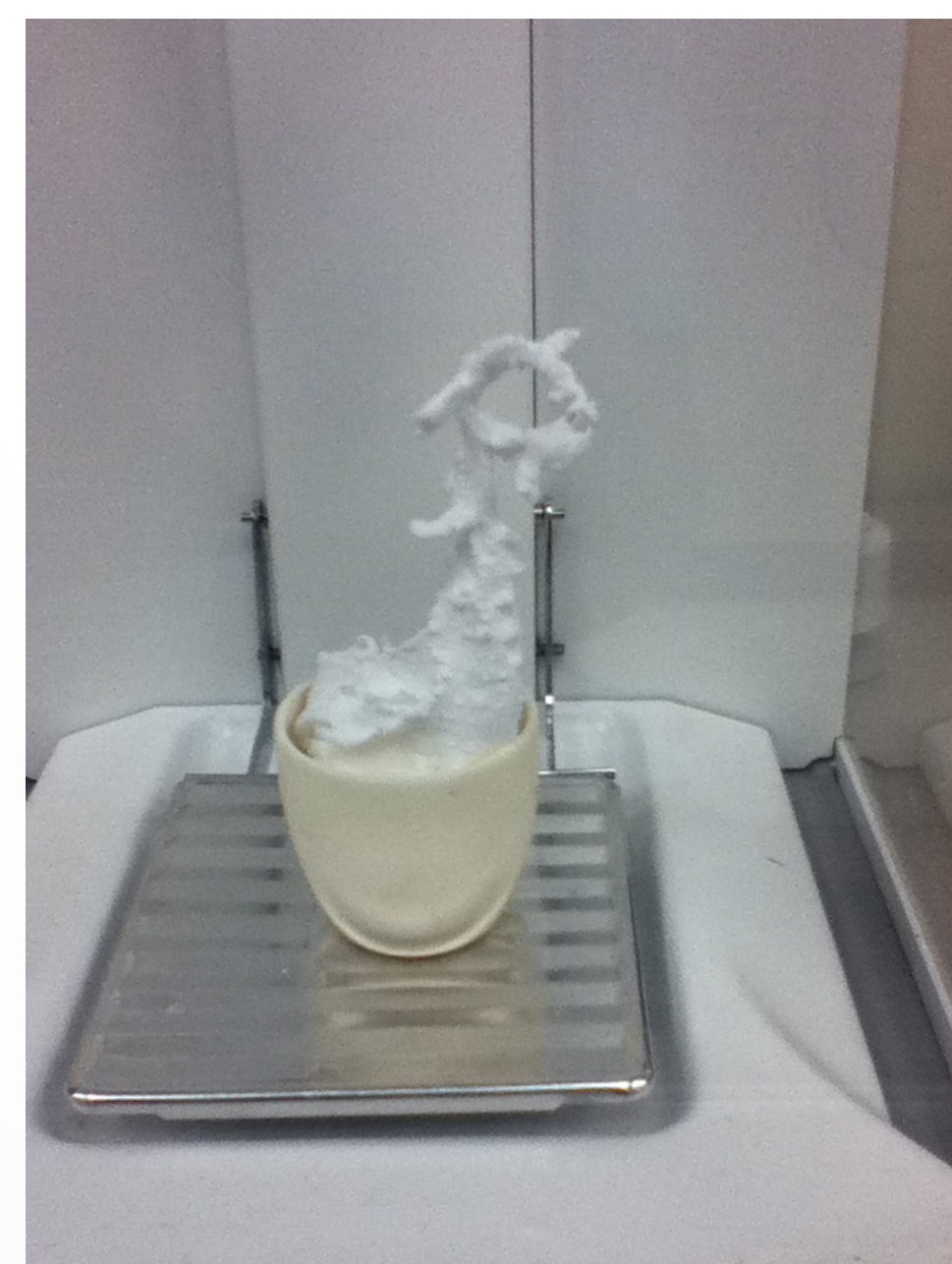
- Luminescence**- the absorption of energy by a material with the subsequent emission of light.



Phosphors under ultra violet light.

Procedure

- The process begins with calculating the stoichiometric equivalents for each of the products and reactants.
- When this is complete, the next step is to calculate the gram amounts of each component in the reaction.
- Then one is to synthesize the phosphor in a process called combustion synthesis.
- Once this is complete it must be calcined to get rid of any impurities.



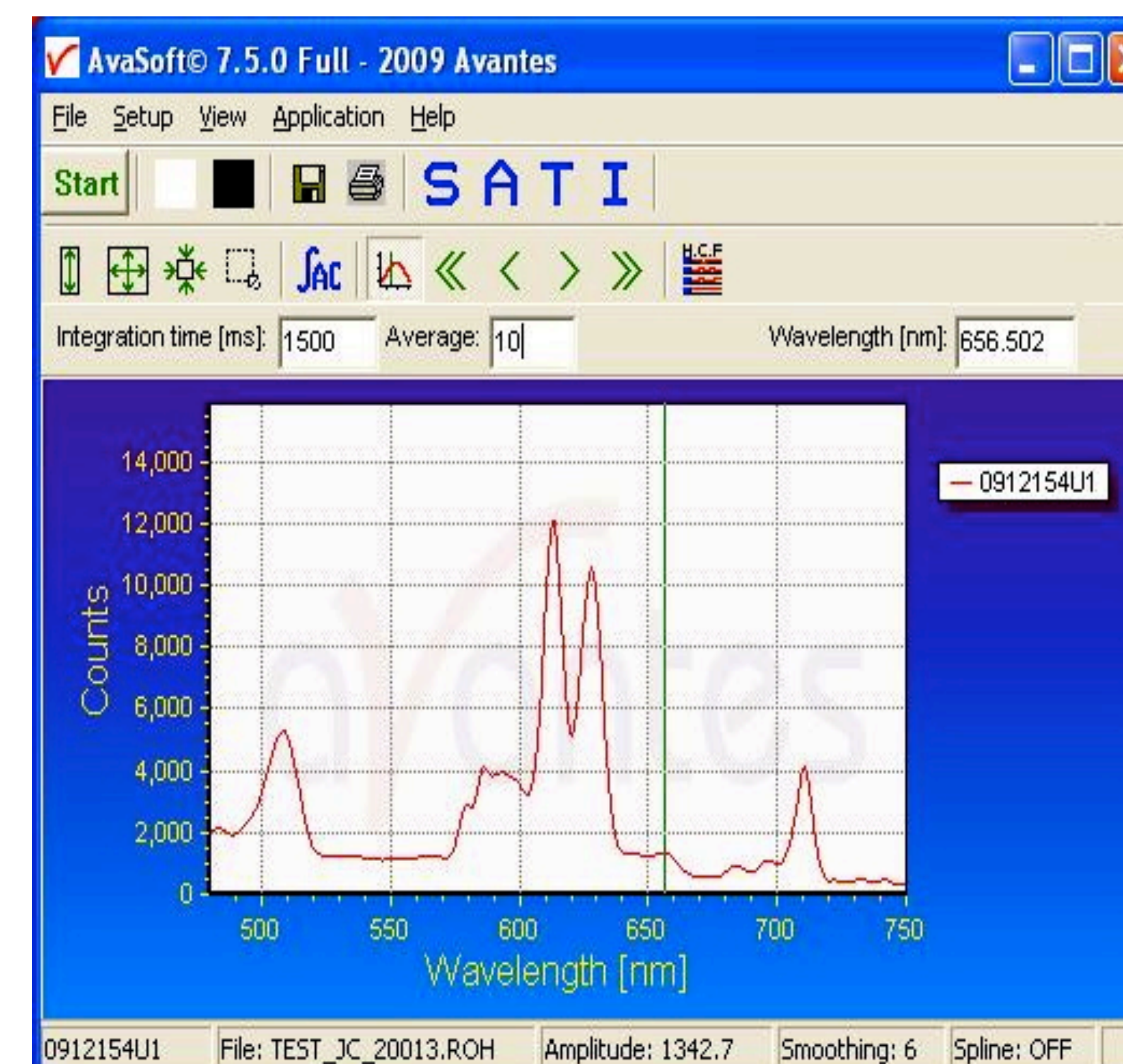
Phosphor after combustion synthesis



Combustion Synthesis

Testing

- It is tested using photoluminescence spectroscopy using an excitation wavelength of 395nm.
- Integration time is 1500ms with the average set to 10.
- During this process the electrons within the phosphor will become excited and jump to another energy level.
- Only when the electrons come back down to the ground state will they give off energy in the form of photons.
- In testing, the luminescence/intensity is being measured against the various wavelengths in the spectra. (Particularly looking at 612nm)
- In theory higher levels of europium means a brighter intensity, however too much europium can have the opposite effect.

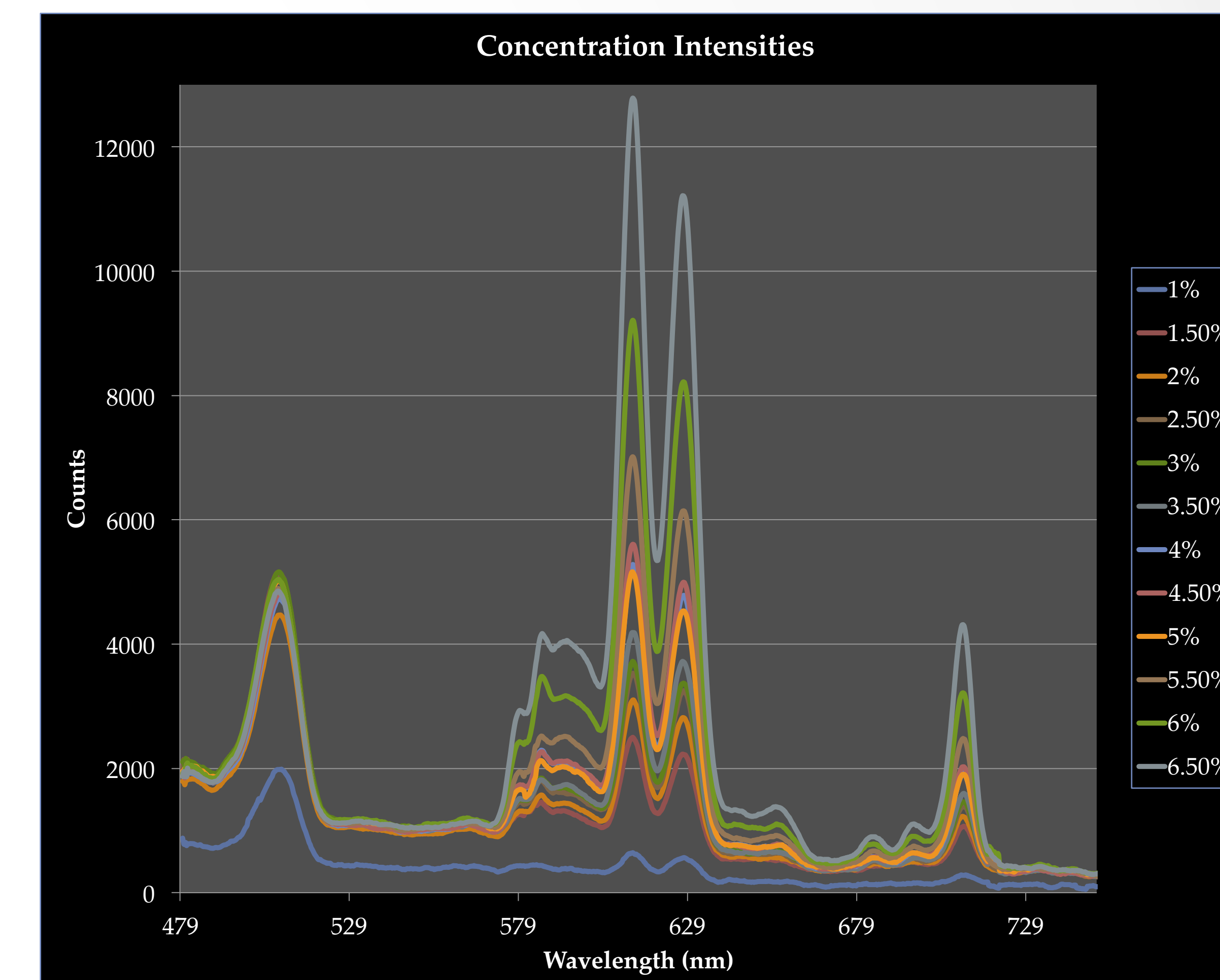


Photoluminescent Spectroscopy

What is the Goal?

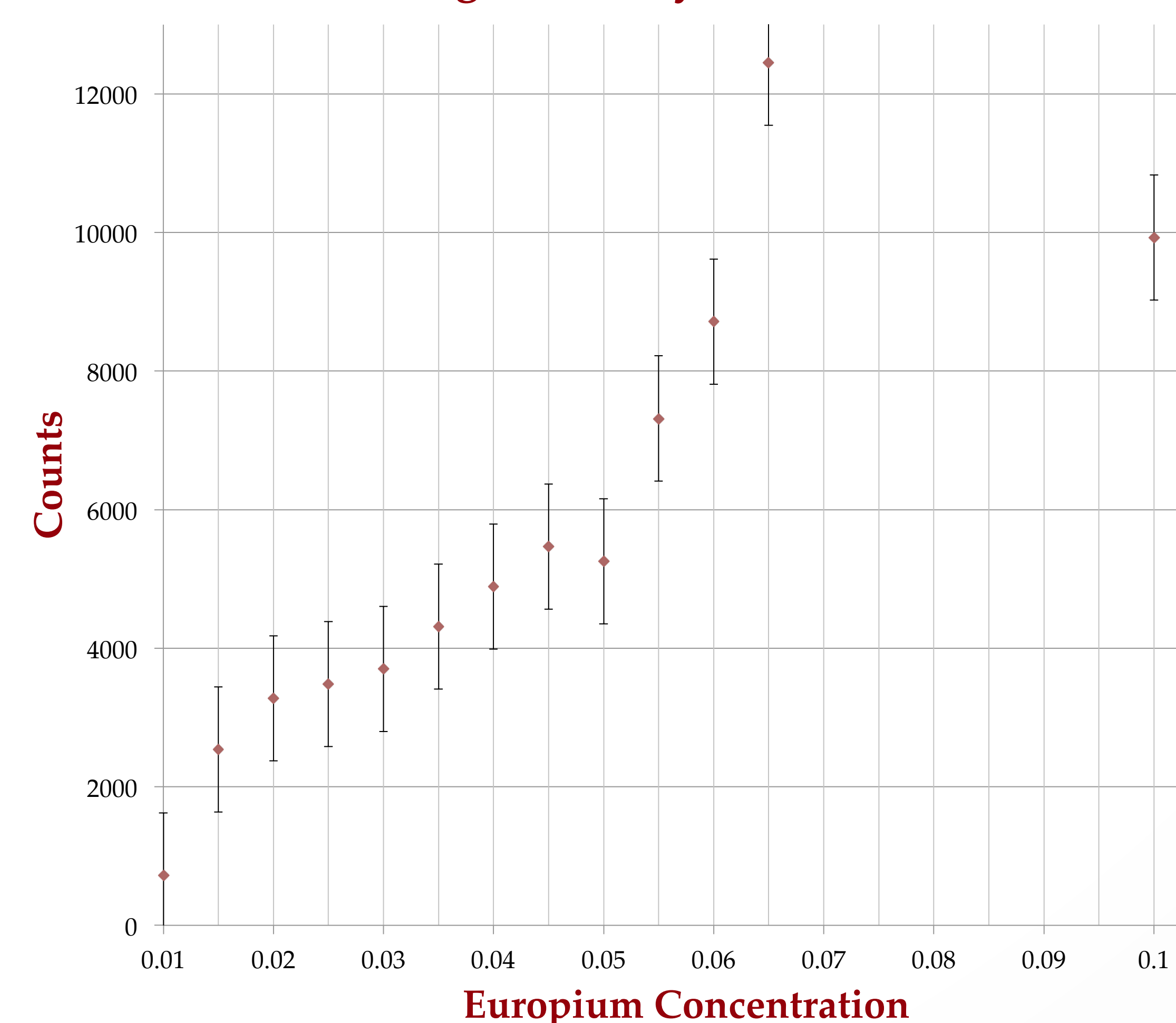
- Currently the quench concentration of europium in LAZ is not known.
- The goal of this summer research project is to find out at what concentration of europium in LAZ will quench.

Test Results



Spectra of 1% to 6.5% europium concentration

Average Intensity of LAZ:Eu



Conclusion

- Phosphor technology has numerous applications.
- A key application is its use as a temperature sensor.
- This research will produce a more sensitive sensor that will be able to relay better results when trying to measure temperature.

Graph of intensity vs. europium concentration (612 nm)

