



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Hao Yang He	Project Number 36458
Project Title Quantum Physics and Glow in the Dark: Observing Luminescent Radiation in Glow in the Dark Materials (Phosphorescence)	
Abstract Objectives/Goals The objective of this experiment was to determine if the brightness of light affect the luminescence of phosphors? And which phosphor (Zinc Sulfide or Strontium Aluminate) would emit brighter light, persist longer, and how do they differ? Methods/Materials Phosphors(Strontium Aluminate and Zinc Sulfide), light sensor, LED flashlight, Logger/Lab Pro hardware & software(online sourced, obtained from teacher), and wood & cardboard for experiment setup. Exposed respective phosphors to LED light for 10 seconds and measured resulting phosphorescence on light sensor for 400 seconds in dark conditions. Brightness of the LED input light was changed between 480 lux, 300 lux, and 130 lux and tested on the phosphors. Results The average was taken for the initial t=0 luminescent value and the time it took for the phosphor to no longer shine. The brightness of input light is proportional to the initial luminescence and persistence of each phosphor. Strontium Aluminate emits more light and persists than Zinc Sulfide but only at high input brightness(480 lux). Zinc Sulfide is consistent in light emission and persistence but does not perform as well as Strontium Aluminate at high input brightness. Conclusions/Discussion The performance of the phosphors is consistent with electrons in atomic energy levels which absorb light energy and releasing photons as they drop down energy levels. The persistence of phosphors indicate an electronic state that holds electrons within energy levels for longer periods of time. The experiment also shows differences in performance between Strontium Aluminate and Zinc Sulfide. Strontium Aluminate requires a high brightness threshold to perform adequately whereas Zinc Sulfide requires a low threshold and then is consistent throughout. Such difference can be caused by the phosphor's manufacturing process and other elements it was mixed with.	
Summary Statement I exposed two different glow in the dark materials (phosphors) to different levels of light brightness and observed trends in initial brightness, brightness over time, and its emission persistence.	
Help Received I designed the experiment myself but had some help from my dad constructing the setup. I also got advice from my chemistry teachers.	