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The Synthesis and Analysis of Two Long Lasting Phosphorescent Compounds: SrAl2O4: Eu2+, Dy3+

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Abstract : This research project focussed on specific compounds, whereas a literature review was completed on the broader subject of long-lasting phosphorescence. For the review and subsequent laboratory work, long lasting phosphorescence compounds were defined as materials that have an afterglow decay time greater than a few minutes. The decay time is defined as the time between the end of excitation and the moment the light intensity drops below 0.32mcd/m2. This definition is widely used in industry and in most research studies. The experimental work focused on known long-lasting phosphorescence compounds – strontium aluminate (SrAl2O4: Eu2+, Dy3+). At first, preparation was similar to literary methods. Temperature, dopant levels and mixing methods were then varied in order to expose their effects on long-lasting phosphorescence. The effect of temperature was investigated for SrAl2O4: Eu2+, Dy3+, and resulted in the discovery that 1350°C was the only temperature that the compound could be heated to in the Differential scanning calorimetry (DSC) in order to achieve any phosphorescence. However, no temperatures above 1350°C were investigated. The variation of mixing method and co-dopant level in the strontium aluminate compounds resulted in the finding that the dry mixing method using a Turbula mixer resulted in the longest afterglow. It was also found that an increase of europium inclusion, from 1mol% to 2mol% in these compounds, increased the brightest of the phosphorescence. As this increased batch was mixed using sonication, the phosphorescent time was actually reduced which produced green long-lasting phosphorescence for up to 20 minutes following 30 minutes excitation and 50 minutes when the europium content was doubled and mixed using sonication.

Keywords : long lasting, phosphorescence, excitation, europium
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