COLLEGE OF SCIENCE
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

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Photo-Induced Fluorescence Enhancement

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Introduction

Photo-induced fluorescence enhancement (PFE) in colloidal quantum dots at ambient conditions is characterized as the increase in fluorescent intensity of the CdSe core ZnS shell quantum dot. The data below shows the effect the substrate as well as the laser power have on this phenomenon.

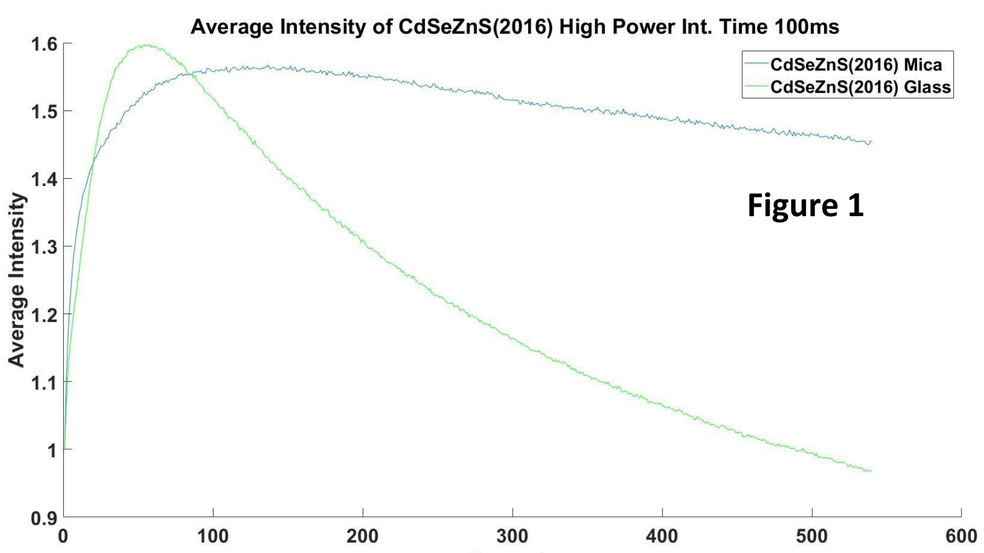

Figure 1

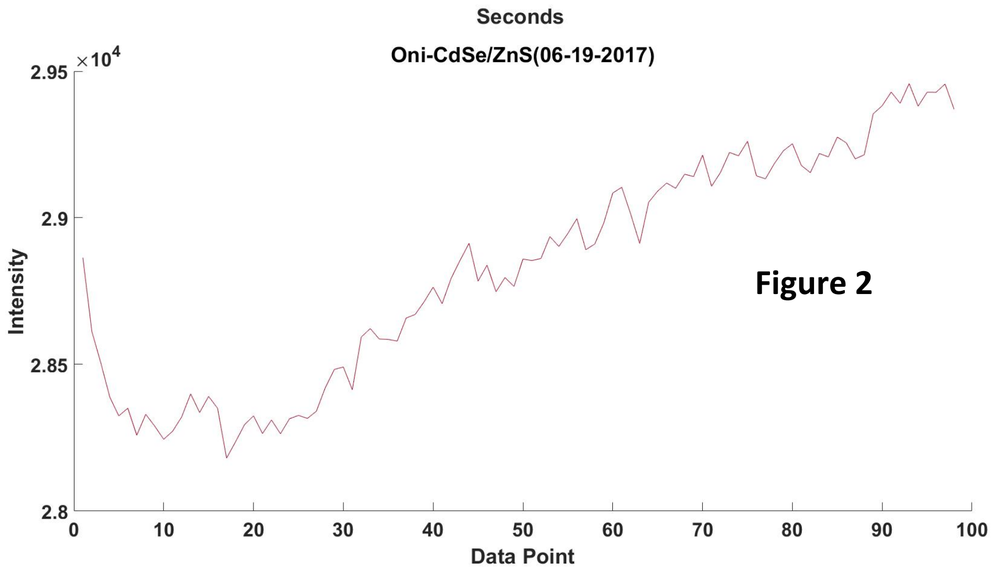

Figure 2

Materials and Methods

For this data collection a 1 watt laser at 550nm was Aimed at a sample holder that housed the Quantum dots. The quantum dots were spin coated directly onto glass and mica substrates. A BW Tek spectrometer and its native software were used to record the spectrum. The CdSe/ZnS Absorb around 630 nm. To gather the most accurate results the quantum dots were shielded from the laser until the moment the spectrum data was being collected.

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Key Findings/Results

The data shows the different effect that both laser intensity and substrate have on the PFE. Lowering the power level appears to lead to an initial lowering of emittance but a continual growth (figure3), while on both mica and glass with high power there is a cut off point for the photo-induced fluorescence enhancement (PFE). The Mica substrate (figure 1) differs from the glass (figure 2) in that its lattice is more tightly knit but not in any other major way. Also worth noting that while the drop for intensity on glass is sharper, the drop occurs after about the same amount of exposure time for both mica and glass substrate samples a little over a minute and a half.

Impact/Conclusions

While in ambient conditions the most impactful variables appear to be the substrate and the laser intensity. Photo-induced Fluorescence enhancement is known to be caused by the atmospheric conditions around the quantum dot, therefore the capacity to test the spectrum of these colloids in a controlled gas chamber could prove invaluable to better understanding the other variables contributing to photo induces fluorescence enhancement.

References

S M Sadeghi, R G West and A Nejat, K Patty, C-B Mao, R R Gutha

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