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Novel Fluorescent Ceramic Nanopaarticles

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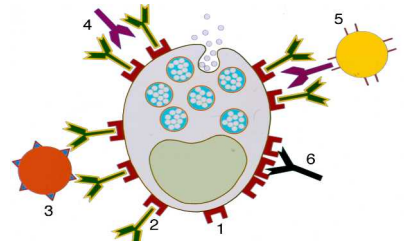
Nanocrystals of the semi-conducting materials cadmium chalcogenides (CdE where E = S, Se, Te) are excellent opto-electronic materials that change color as the size of the particle changes (the size of these particles dictate the emission wavelength). The intensity and flexibility allows for them to be used as 'tags' in biological for concurrent analysis of multiple event systems. Unfortunately, the toxic properties of Cd will ultimately limit the widespread use of these materials for biological research.

In an effort to circumvent the toxic nature of CdE materials, we have undertaken the synthesis of luminescent nanomaterials that are lower in toxicity but still possess the characteristics of the chalcogenide-based materials. In particular, we have focused on generating two new types of nanomaterials based on naturally occurring fluorescent NOF mineral and lanthanide based nanoceramic (LBN). Mast cells and their response to allergens are the biological system that is being explored. Using monovalent funcationalized CdE materials while the NOFs and LBNs are being developed, the unusual corral behavior on the surface of the cells has been observed and tracked using an in house program..



For the NOF materials we have investigated a number of oxide systems composed of what is classically thought to be inert. For example a NOF that possesses a simple composition with species that are considered benign is ferroan sphalerite or iron zinc sulfide [(Fe,Zn)S]. Further studies have involved tungsten based nanomaterials (WBN) and alkaline earth oxide materials along with nitrate, sulfate, and silicate derivatives. alternatively, LBN materials that are not based on the halides, have also been investigated. For example we have found that zinc oxide doped with Eu [a.k.a., ZnO-Eu] yield luminenscent material. This material demonstrates luminosity equal to that of the CdE materials and is water souble based on the diol surfactant.

While we have had a great deal of success in synthesizing luminenscent materials, the intensity of the NOFs and LBNs materials typically is greatly lacking in comparison to CdE materials. Very muted colors are often the result and improvement in these intensities is necessary. This presentation will briefly discuss the project and our approach to solving the issues.

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