VIDEO ARTICLE

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Using Eu^{3+} as A Versatile Probe for Local and Long-range Chemistries

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Abstract

Rare earth elements play a significant role in the global economy due to their unique luminescent, catalytic, and magnetic properties resulting from their *f* electrons. Of these rare earths, Eu is commonly used as a luminescent center due to its temperature and structural responses and its ability to electronically couple with transition metal ions. However, the luminescent host must be carefully designed in order to take advantage of these unique properties as atomic and long-range chemical probes. Using a combination of synthetic methods (molten salt, sol-gel, hydrothermal), we are able to spatially control dopant ions within core-shell nanoparticles. When these nanoparticles are exposed to different external stimuli (temperature, magnetic fields, chemical environments) the characteristic Eu luminescent spectrum undergoes unique changes, which we can model to extract the local and long-range chemical environments. In this presentation, I will discuss our research using Eu to design new nanostructures and their dynamic luminescent signal for ferroelectric, catalytic, and biological sensing applications. By engineering these nanostructures, we have been able to improve the temperature and concentration sensitivities using non-invasive, low-cost approaches.

Biography of Presenting Author

James Dorman is an assistant professor in Chemical Engineering at Louisiana State University. Prior to joining LSU, James was an Alexander von Humboldt research fellow at Konstanz University in Germany where he worked on optimization of next generation solar cells by charge separation and transport across hybrid interfaces. He received his Ph.D. from UCLA in 2012 where he worked on white light LEDs with Jane Chang and his B.S. from UCSD.

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