Rare Earth Oxide Composites

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BACKGROUND

Rare Earth (RE)-doped materials are a focus of many subfields of optical research, particularly those involving light-emitting diodes, lasers, and optical fibers. Combination of RE oxides with other materials expands the applicability of these materials in optics. Nanoscale RE element-containing compounds attract considerable interest due to their use in fluorescent optical detectors of biomolecules and ions, as well as their application in temperature sensors for biological applications. Upconversion of optical radiation in RE-containing nanoparticles may be used in optical imaging probes for biomedical applications.

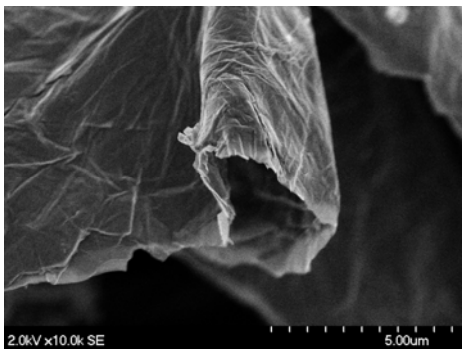
Current research efforts in this field target, among other topics, the innovation of the preparation methods of RE oxide composites. Two primary obstacles to wider development of RE oxide composites for optical applications are a lack of controlled material morphology and insufficient dispersion levels of RE materials onto carrier surfaces. There presently exists a need for preparation technologies designed to provide increased control and efficiency of RE composite materials at a reduced cost.

TECHNOLOGY

University of New Mexico and New Mexico Tech researchers have developed a method to synthesize composite materials containing small rare earth (RE) oxide nanoparticles with controllable morphology, structure, and chemical composition. The composite materials may be derived from any source of RE precursors, where the preparation method is based on the chemical/physical deposition of precursors followed by their thermal decomposition on the surface of the carrier material (graphene, carbon nanotubes, silicon, etc.) with additional tuning of the morphological, structural, and chemical properties to achieve the characteristics required for optical applications.

ADVANTAGES/APPLICATIONS

- Synthesized materials are malleable to morphological, structural and chemical fine-tuning, making them adaptive to various optical applications
- Cheap commercial precursors can be used
- Crystal structure and chemical composition can be controlled by the variation of synthesis parameters
- Synthesized RE composite materials are inexpensive to manufacture
- Applications include: bio-imaging and biosensors, optical fibers, light emitting devices, and laser technologies



SEM image of nitrogen doped graphene

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