University of Central Florida

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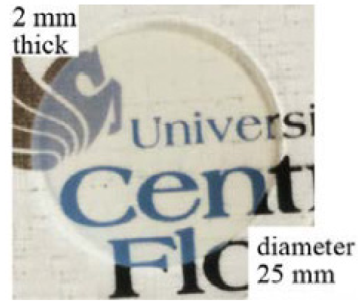

Proof-of-concept of a transparent polymer–CaF2:Eu2+ composite scintillator fabricated at UCF according to the proposed approach.

Bulk Optical Polymer Composites with 220% Higher Particle Loading Capacity

Currently available methods of fabricating materials—used in radiation detection (scintillation); low-power, solid-state lasers; lighting; wavelength shifting; and light filtering applications—require intensive processing to minimize particle clumping, light scattering, and reduced transparency. Increasing particle loading capacity without sacrificing transparency due to clumping has been a fundamental challenge with powder volume fractions limited to only 20%. Now, UCF researchers have developed a new way to incorporate composite scintillator materials for bulk optical polymer composites to the dramatically higher level of around 64%. Polymer composites formed with this method offer better physical properties while remaining simple to manufacture, for lower cost and more scalability compared to alternatives including single crystal and optical ceramic materials with high temperatures and long processing times. Optical composites created with this method can improve photonic devices including displays, Christiansen filters, and wavelength shifters; scintillators; and low-power lasers. The improved optical qualities and cost reduction translates directly to applications including large-scale radiation detectors for homeland security, medical imaging, and wavelength shifters for solar energy harvesting.

Technical Details

To fabricate the optical composite, a near final shape ceramic powder compact is first formed by a dry consolidation method, such as cold isostatic pressing, and then infiltrated by a monomer or a molten polymer while under vacuum. The added material is then polymerized using an initiator, heat, or UV curing. The method does not call for sintering, and so remains low-temperature at less than 200 degrees Celsius. In the absence of high temperatures used in conventional processing, materials formed with this method can retain near final shape for a more streamlined manufacturing process.

UCF Inventors

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Benefits

- Increases particle load percentage from former limit of 20% to 64% without sacrificing transparency
- Low-temperature: efficient, scalable

Applications

- Photonic devices:
  – Displays
  – Christiansen filters
  – Wavelength shifters
  – Scintillator detectors
  – Low-power lasers
- Homeland security
- Medical imaging
- Solar energy harvesting

Tech Fields

Optics & Lasers

Keywords

bulk optical polymer composite, scintillation, particle loading, optics, transparency

If you or your company are interested in this opportunity, Contact:

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