

Persistent Luminescence at the Interface Between Materials Science, Physics, and Chemistry

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Persistent luminescence is characterized by prolonged photon emission following the removal of external excitation. This phenomenon, driven by the trapping and thermal or optical release of charge carriers, serves as a precise tool for investigating defect architectures in wide-bandgap materials. Understanding carrier dynamics and trap-state distribution is essential for advancing research in solid-state chemistry and photonics [1].

In this work, we evaluate tailored phosphor systems with tunable persistent and thermoluminescent properties [1-3]. Through strategic co-doping and controlled synthesis, we demonstrate how host defect engineering dictates trap distribution and emission kinetics. These findings suggest that engineering charge traps may facilitate the design of materials for low-background imaging and thermometric probes. These studies contribute to the ongoing efforts to integrate long-lasting emission functionalities into next-generation sensing applications.

Furthermore, we explore the emerging field of radioluminescence thermometry, assessing phosphor stability under ionizing radiation. By analyzing temperature-dependent X-ray-excited emission, we highlight these materials' potential for thermal monitoring in environments where optical excitation is limited.

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