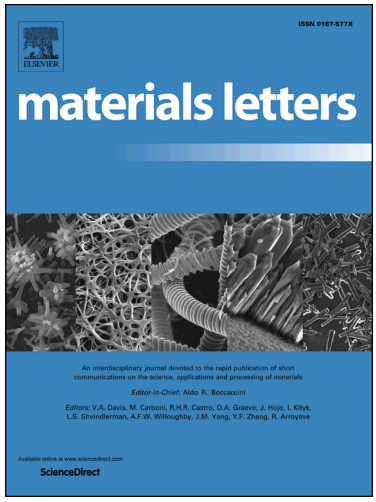

Suitable Medium for $CsPbBr_3$ Quantum Dots Toward Light-Emitting-Diodes Fabrication

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Suitable Medium for $CsPbBr_3$ Quantum Dots Toward Light-Emitting-Diodes Fabrication

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Abstract: To research optical properties of materials for light-emitting-diodes (LEDs) fabrication, $CsPbBr_3$ quantum dots (QDs) were dispersed in five different substrates to investigate their luminescence. The results show that $CsPbBr_3$ QDs embedded in glass matrices have superior stability, however, the QDs could not be evenly distributed in the matrices, which resulted in uneven luminescence of the glass. To solve this problem, epoxy resin was introduced as cladding material, which yielded a product that had good stability and consistency. $CsPbBr_3$ QDs embedded in epoxy resin show great potential for green fluorescent components in LED applications.

Keywords: Ceramics; Luminescence; Nanosize

1. Introduction

$CsPbX_3$ quantum dots (QDs) are promising materials with excellent properties, such as being bright and having tunable photoluminescence, a narrow emission spectrum, the emission wavelength of size effect, and high luminous efficiency [1-4]. Given its huge potential in many fields, researchers working in the areas of light-emitting diodes [5-7], laser polarizers [8], polarizers [10-11], solar cells [12-13], and photoelectric detectors[14] have expressed interest in $CsPbX_3$ QD materials. The biggest problem with many materials used in this research is their poor stability in air. Additionally, solvents used to disperse QDs are volatile and have adverse effects on the environment and the human body. $CsPbBr_3$ QDs are a widely studied form of green fluorescence, which possess a considerable quantum yield (QY). In 2015, Kovalenko et al. prepared a series of $CsPbX_3$ nanocrystal solutions with a wider color gamut. The highest QY of $CsPbBr_3$ nanocrystal solutions has reach up to 90% [15]. Fully inorganic $CsPbBr_3$ perovskite QDs films were successfully fabricated as green-emitting luminescent materials for white-light generation by Song et al. in 2016, and the absolute photoluminescence quantum yield (PLQY) was measured to be 37.2%. To maintain a high degree of green luminescence in $CsPbBr_3$ QDs, a nanocomposite was prepared by a simple and effective method in 2017 by Di et al. [16]. In the same year, a series of $CsPbBr_3$ QD zinc borosilicate glass were fabricated successfully by Xiang et al., who studied the concentration of QDs embedded in glass matrices. Using this fabrication method,