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All-inorganic Cs2AgBiBr6 Double Perovskite Single Crystals for Radiation Detectors: Exploring the Effects of Temperature, Concentration, and Time

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In recent years, all-inorganic double perovskites have gained significant interest as promising candidates for a wide range of optoelectronic applications, particularly in the field of radiation detection. Cs2AgBiBr6, a double perovskite with a low toxicity profile and high chemical stability, has attracted substantial attention due to its potential for enhanced radiation detection performance compared to traditional materials. In this study, we will provide a comprehensive investigation into the effects of temperature, concentration, and time on the synthesis and properties of Cs2AgBiBr6 single crystals, with the ultimate goal of optimizing the material for efficient and reliable radiation detector applications. Through meticulous control and modulation of these parameters, we will uncover crucial insights into the crystal growth process of Cs2AgBiBr6, and elucidate how specific changes in temperature, concentration, and time affect the resulting material properties. We will examine the impacts of these factors on parameters such as defect densities, crystal morphology, and electronic properties, as well as how they influence the overall performance of Cs2AgBiBr6-based radiation detectors. In addition to the experimental results, we will provide a theoretical framework that supports our findings and helps explain the underlying mechanisms governing the crystal growth and performance of Cs2AgBiBr6. This comprehensive study will not only contribute to the understanding of Cs2AgBiBr6 synthesis and optimization, but also serve as a reference for future research on other all-inorganic double perovskite materials. The outcomes of our research pave the way for further development and refinement of Cs2AgBiBr6-based radiation detectors, unlocking the full potential of this promising materials. Ultimately, these advancements will lead to the design and fabrication of high-performance, environmentally friendly radiation detectors, based on all-inorganic double perovskite materials. These offering significant benefits in terms of both safety and efficiency for a variety of applications, including medical imaging, homeland security, and environmental monitoring.

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