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Studies of glass matrices for the nucleation and growth of luminescent and lead-free A2BIBIIIX6- type double perovskite

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Double perovskites (DPs) are promising materials for photonics due to their unique optical and electronic properties and lead-free composition. However, their instability under environmental conditions (humidity, temperature, oxidizing agents) hinders potential applications. To address this, studies have explored incorporating DPs into organic and inorganic matrices, though their integration into glass remains underexplored. [1] This study focuses on oxide glasses as hosts for luminescent halide double perovskites of the $A_2B^{I}B^{III}X_6$ (X=Cl, Br, I) type. For this, glass containing precursors of Cs_2NaEuX_6 DPs was synthesized via melt-quenching, followed by thermal treatment above the glass transition temperature (T_g) to promote the *in-situ* DP growth. The structure of the samples was investigated by Raman and XRD, which confirmed the formation of a glassy network. SEM-EDX analysis confirmed the incorporation of halide species into the glass after melting and heat treatment. The optical properties were characterized using UV-Vis spectroscopy and photoluminescence, through which it was possible to observe the narrow emission bands $^5D \rightarrow {}^7F_J$ (J = 0-4) of Eu(III), as well as broad bands centered on ~440 nm, which may be related to emissions by self-trapped excitation (STE) mechanisms, suggesting the precipitation of DPs in the glass. Nevertheless, the process of nucleation, growth, and dissolution of the DPs needs to be optimized and better understood to allow greater control of the properties of the luminescent glass.

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References

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