# Synthesis and Comprehensive Characterization of the Novel Mixed-Halide Perovskite $DMAPbI_{1.5}Br_{1.5}$

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Hybrid organic–inorganic perovskites continue to garner attention for their tunable optoelectronic properties and potential applicability in diverse energy-related technologies [1]. This study reports the synthesis and comprehensive characterization of the novel compound $[(CH_3)_2NH_2]PbI_{1.5}Br_{1.5}$ ($DMAPbI_{1.5}Br_{1.5}$), a mixed-halide perovskite within the dimethylammonium lead halide ($DMAPbX_3$) family, where X represents I, Br, or Cl. The compound was synthesized via a solution-based approach in *N,N*-dimethylformamide, using stoichiometric amounts of pre-synthesized $DMAPbI_3$ and $DMAPbBr_3$ as precursors [2], yielding a yellow crystalline product. Powder X-ray diffraction (PXRD) confirmed the formation of a crystalline mixed-halide phase distinct from the parent compounds, indicative of successful halide incorporation into a single perovskite structure. Scanning electron microscopy (SEM) revealed porous, aggregated microcrystals, and energy-dispersive X-ray spectroscopy (EDX) confirmed a near 1:1 atomic ratio of iodine to bromine, consistent with the target composition. Vibrational spectroscopic (infrared and Raman) analyses displayed vibrational features characteristic of both the organic cation and the metal-halide lattice, supporting structural integrity. Cyclic voltammetry measurements in dichloromethane with tetrabutylammonium perchlorate (TBAPC) as the electrolyte and a paraffin-impregnated graphite electrode (PIGE) revealed redox activity, with decreasing current responses over successive scans, indicative of partial electrochemical degradation of the compound.

**Keywords:** $DMAPbI_{1.5}Br_{1.5}$, mixed-halide perovskite, PXRD, SEM-EDX, vibrational spectroscopy, cyclic voltammetry

## References

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