Broad emission from the structural distortions induced by substituting trivalent element Sb^{3+} in low dimensional halide perovskites

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Abstract

Hybrid lead halide perovskites [$APbX_3$] have attracted a great deal of attention due to their outstanding tuneable broad-band emission and charge transport properties. The toxicity of lead hinders their further application in the photoelectric field. Here, we report tuneable broadband emission obtained in lead-free vacancy ordered triple halide perovskites [$A_3M_2X_9$] due to self-trapped excitons (STE) by tuning the M^{3+} cation.[1],[2] In this work, we have systematically prepared $Cs_3Sb_aBi_{2-a}X_9$ (X=Cl, Br, I) with x between 0 and 2, where at $x \neq 0$ & 2 we obtain mixed trivalent cations in the triple perovskites. We explored the distortion in these materials using a combination of Raman and FT-far-IR spectroscopic measurements. Finally, we investigated the effect of distortion of these materials on the photoluminescence properties.

REFERENCES

[1] K. M. Mccall, C. C. Stoumpos, S. S. Kostina, M. G. Kanatzidis, and B. W. Wessels, Chemistry of Materials, 29 (2017) 4129-4145.
[2] Hong, K. H., Kim, J., Debbichi, L., Kim, H., & Im, S. H., The Journal of Physical Chemistry C, 121 (2017) 969-974

FIGURES

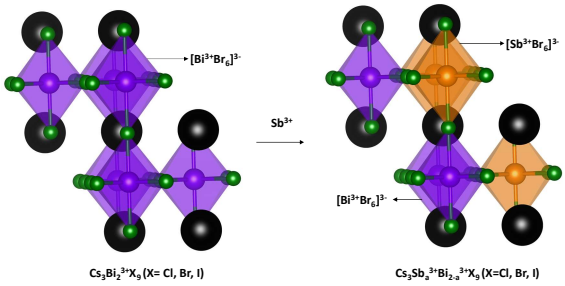

Figure 1: Method of doping Sb^{3+} in Bi^{3+} based lead-free halide perovskites.

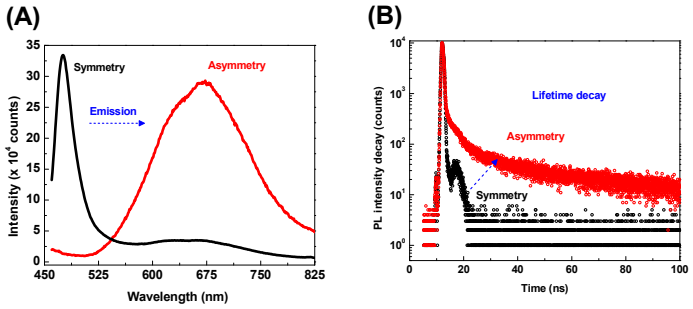

Figure 2: A & B are Emission and lifetime of undoped (symmetry) and doped (asymmetry) of $Cs_3Sb_aBi_{2-a}X_9$ (a=0, 0.5, X=Br) perovskite materials.