Doping engineering in halide perovskite, an efficient synthesis method of white LEDs

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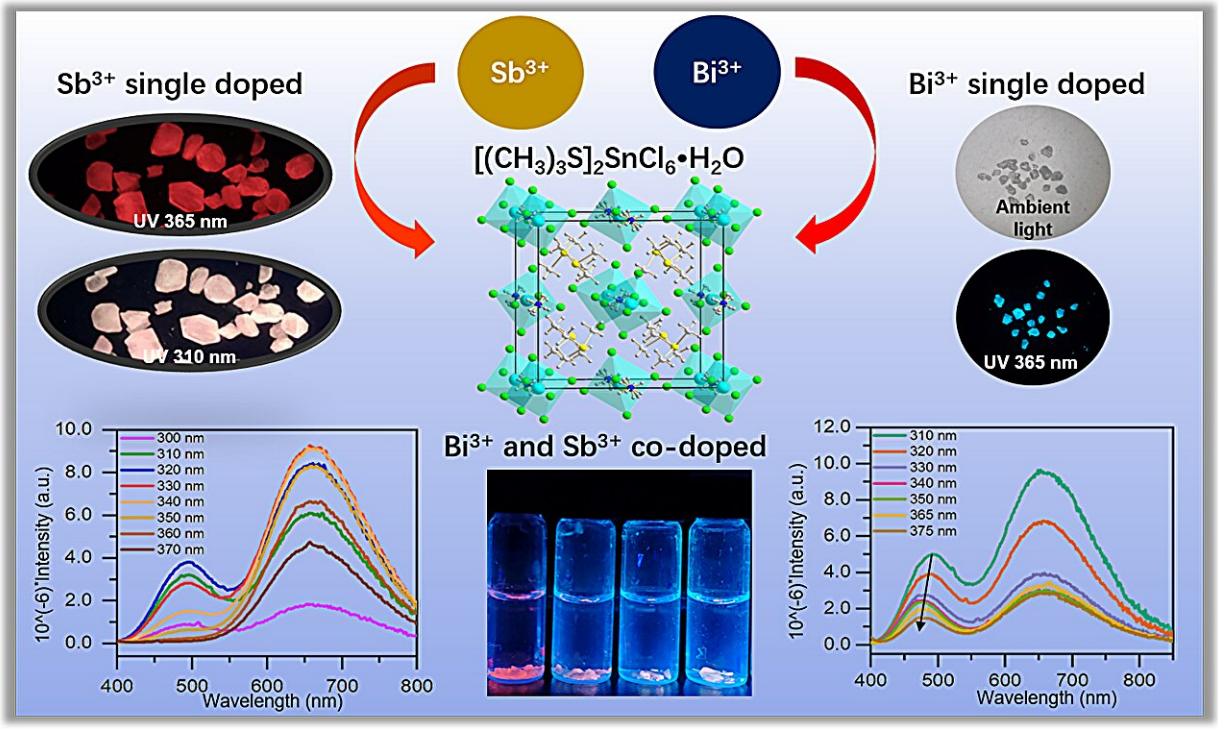

Luminescence properties of Sb^{3+} doped andBi^{3+}/Sb^{3+} co-doped $[(CH_3)_3S]_2SnCl_6{\times}H_2O$. Credit: Yitong Lin, Yu Zhong, Yangpeng Lin, Jiawei Lin, Lei Pang, Zhilong Zhang, Yi Zhao, Xiao-Ying Huang, Ke-Zhao Du

In 1879, Edison invented the incandescent lamp, which brought light to the night. In 1969, the first red light emitting diodes (LEDs) lamp came out. However, as the key to making white light bulbs, high-energy blue

light has not been successfully commercialized.

Until 1998, when Japan's Nakamura Shoji made white LEDs, which marked the official entry of LEDs into the lighting era. LEDs have the advantages of high efficiency, environmental protection and energy saving.

Metal halide perovskites (MHPs) have become a powerful candidate for new LEDs due to their excellent photoelectric properties. By doping metal ions into MHPs, fluorescent materials with different luminescent colors can be manufactured.

A team led by Professor Ke-Zhao Du of Fujian Normal University, China, is very interested in the dopant-controlled luminescence in zero-dimensional (0D) MHPs. Their work, titled "White light emission in 0D halide perovskite $[(CH_3)_3S]_2SnCl_6{\times}H_2O$ crystals, through variation of doping ns^2 ions," was published in *Frontiers of Optoelectronics*.

The advantages of 0D MHPs, such as simple synthesis and superior tolerance for guest ions, have attracted their attention. However, they noticed that the luminescence color of single-doped MHPs is generally single, and the blue emission is insufficient.

In addition, their inferior stability at ambient environment is also a problem. Therefore, they chose an aprotic cation with moisture resistance to synthesize Sb^{3+} doped (or Bi^{3+}/Sb^{3+} co-doped) $[(CH_3)_3S]_2SnCl_6{\times}H_2O$, which achieved tunable white light emission with sufficient blue emission component.

More information: Yitong Lin et al, White light emission in 0D halide perovskite $[(CH_3)_3S]_2SnCl_6{\cdot}H_2O$ crystals through variation of doping ns^2

ions, *Frontiers of Optoelectronics* (2024). DOI: 10.1007/s12200-024-00109-3

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