

# Growth, structure solution and spectroscopic study of a new $(\text{NH}_4)_2\text{Mn}_{1-x}\text{Zn}_x(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ Tutton salt for adjustable yellow-orange light emission

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Manganese-containing materials have been widely used to produce red phosphors for use in visible light-emitting systems [1]. However, the orange light emission of  $\text{Mn}^{2+}$  ions is rarely related in the literature and strongly dependent on the host matrix. This work reports new mixed crystals of manganese-zinc sulfate hexahydrate with yellow-orange light emission synthesized by the isothermal evaporation method. The samples were characterized by X-ray powder diffraction (XRPD) and spectroscopic measurements of molecular absorption, excitation, and emission. The crystal structure  $(\text{NH}_4)_2\text{Mn}_{0.5}\text{Zn}_{0.5}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$  was resolved by XRPD and refined by the least-squares method implemented in the TOPAS® software. The influence of different zinc concentrations on the spectroscopic properties of  $\text{Mn}^{2+}$  ions significantly altered the emission of visible light in the samples, reproducing colors between the yellow and orange regions. Also, low correlated color temperature values were found for these crystals. The results obtained in this study strongly suggest that the  $(\text{NH}_4)_2\text{Mn}_{0.5}\text{Zn}_{0.5}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$  Tutton salts are promising candidates for applications in solid-state lighting.

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**References:**

[1] Zhou, Q. and Dolgov, L., Journal of Materials Chemistry C 6, 2652-2671 (2018).