The influence of the metal ion on spectroscopic properties of $[DMA]M(HCOO)_3$: Cr^{3+} ($M = Zn^{2+}, Mn^{2+}, Mg^{2+}$) hybrid perovskites for luminescence thermometry

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Temperature is one of the most significant conditions in a various field of science and technology. Thus, the accurate monitoring of this parameter makes a necessary to develop sensing solutions fitted to specific requirements. Even though conventional sensors provide sufficient characteristics for the majority of the undemanding applications, the specific scientific, industrial, and biomedical sectors require to use of remote sensing systems. Luminescent thermometry - the novel approach to temperature monitoring, may overcome the limitations of the conventional sensing systems.

The group hybrid perovskites with the general formula $[A]BX_3$, where A is an organic cation (e.g. DMA^+), B stands for a metal cation (e.g. Mn^{2+}) and X is for the anion (e.g. HCOO-), has attracted increasing attention due to their multifunctional properties. [1,2] By changing the composition of the host materials, the luminescence of the Cr^{3+} can be modulated. The crystal field strength (Dq/B) induces the main emission type of the chromium trivalent ions: narrow spin-forbidden $^2E_g \rightarrow {}^4A_{2g}$ or broad spin-allowed $^4T_{2g} \rightarrow {}^4A_{2g}$ transitions. The luminescence of the Cr^{3+} ion in the investigated structures is strongly dependent on the temperature. The temperature-dependent luminescence has been a basis for the thermometric model determination. The obtained results confirm the great potential of the sensing materials based on the hybrid perovskite materials containing Cr^{3+} ions.[3]

The presentation will contain the structural and spectroscopic analysis of the investigated materials, with particular emphasis on their implementation as highly sensitive luminescent thermometers. The influence of the composition on the optical characteristics as well as a determination of the thermometric model will be described in detail.

[1] Kabański A., Ptak M., Stefańska D. (2023) *ACS Appl. Mater. Interfaces*, 15, 7074-7082
[2] Ptak M., Sieradzki A., Simenas M., Mączka M. (2021) *Coord. Chem. Rev*. 448, 213180
[3] Stefańska D., Kabański A., Vu Q., Adaszyński M., (2023) *Sensors*, 15, 6259

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