

Frontiers of Deep-Red Emission of Mn⁴⁺ Ions with Ruddlesden–Popper Perovskites

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Streszczenie

It is well-known that the chemical composition of the host material significantly affects the spectroscopic performance of transition metal ions. However, it is worth noting that also the structure and symmetry of crystallographic sites play significant roles in transition metal ion luminescence. In this study, we demonstrate three perovskite structures of strontium titanate forming so-called Ruddlesden–Popper phases doped with Mn⁴⁺ ions. The observed reduction in the average Tl⁴⁺–O^{2–} distance in the series SrTiO₃–Sr₂TiO₄–Sr₃Ti₂O₇ allowed for a record-breaking shift in the spectral position of Mn⁴⁺ emission band with a maximum of around 734 nm and led to an improvement of the already impressive thermometric performance of SrTiO₃:Mn⁴⁺ in ratiometric and lifetime-based approaches. This research encourages a further search for structures that, with the help of the developed correlations between structural and optical properties, could lead to the discovery of phosphors beyond the limits established so far.

Słowa kluczowe

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