

Luminescence properties of a ZnO–In₂O₃ composite

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<https://doi.org/10.1002/pssc.200669542>

Abstract

ZnO–In₂O₃ composite was prepared by thermal annealing of ZnIn₂S₄ crystals. Energy dispersive X-ray analysis demonstrated that annealing results in the formation of a composite consisting of ZnO and In₂O₃ phases with the ratio 1:1 as well as of a small amount of the initial ZnIn₂S₄ phase, which concentration depends on the duration of annealing. The composite exhibits bright luminescence with different colors coming from different constituents, the spectral distribution being dependent upon the wavelength of excitation. The photoluminescence spectrum is predominated by ultraviolet emission from the ZnO crystallites under the excitation by the 351 nm line of an Ar⁺ laser, while a blue-green photoluminescence band related to the In₂O₃ crystallites emerges under the excitation by the 334 nm line. The sample reveals a bright red emission from the ZnIn₂S₄ phase when it is excited by the blue-green light. The electronic transitions responsible for the observed luminescence lines are discussed.