Combustion Synthesis of Zinc-Manganese-Sulfur Compound Systems

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ABSTRACT

The compounds of Mn-mixed ZnS as luminescent materials have been synthesized by a combustion synthesis technology using powder compacts with starting composition of \((1-x)\text{Zn}+x\text{Mn}+y\text{S} \ (x\leq0.05, \ y=1.1)\). The results of X-ray diffraction of products showed that only \(\beta\)-ZnS was identified even when the manganese ratio was maximum \((x=0.05)\). The peaks of photoluminescent spectra of the products, however, shifted gradually from 480nm \((x=0)\) to 580nm \((x=0.05)\) with increase of added manganese. The peak at 480 nm was related to a self-activated (SA) emission, caused from some vacancies of \(\text{Zn}^{2+}\) ions in the \(\text{ZnS}\) matrix, and that at 580nm was from 3\(d^5\) orbital transition of \(\text{Mn}^{2+}\) ions. The present results indicated that \(\text{Mn}^{2+}\) ions penetrated uniformly into the vacancies of \(\text{Zn}^{2+}\) ions in \(\text{ZnS}\) matrix with increase of added manganese. As a result of the present work, it was confirmed that \(\text{Mn}^{2+}\) ions could be distributed uniformly into the \(\text{ZnS}\) matrix following the additional ratio of manganese by the combustion synthesis technology.