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論 文 内 容 の 要 旨

氏　名　　LORCHIRACHOONKUL PRINYA

This study aimed to develop the zinc tungstate by doping with other materials. In the first part of this thesis, potassium salts in different contents were added into zinc tungstate. After that, the samples were investigated the effect in photoluminescence properties of the sample and confirm the highest content which obtains the highest photoluminescence intensity. In the second part of this thesis, zinc tungstate was doped with alkali metal salts. By using the data from the first part, the alkali metal salts contents were decided.

Alkali metal salts doped zinc tungstates were confirmed for their structure and were evaluated for their optical properties. First, for potassium salts doping, the powders were mixed with the molar ratios of ZnO: WO_3: potassium salts = 1: 1: x and sintered at 800°C for 3 h in air. The grain size of samples increased when potassium salts were doped. Potassium and anions were considered to dissolve in $ZnWO_4$ and change the lattice constants. The photoluminescence intensity of the samples was significantly increased when potassium salt content x was 0.02. The order of each maximum photoluminescence intensity was KNO_3, K_2SO_4, KCl. The different cations and anions doping changed the structure of the sample and affected the emission peak intensity. It could be concluded that the radiative transitions between tungsten and oxygen can be enhanced by doping with potassium and anions.

For alkali metal nitrate and sulfate, the grain size and the lattice parameter of the samples was increased after doping. It was confirmed that dopant was dissolved into the samples and changed the crystal structure. For photoluminescence properties, the intrinsic emission peak of the samples excited at 275 nm was observed at 465 nm. The photoluminescence intensity of the samples was significantly increased when $NaNO_3$, KNO_3, $RbNO_3$, $CsNO_3$ were used as dopants. Moreover, the different cation doping changed the crystal structure of the sample and affected the emission peak intensity. $RbNO_3$ doping gave the highest crystallinity which resulted in the highest photoluminescence intensity. But $LiNO_3$ doping gave the photoluminescence weaker than the undoped sample and other doped samples, which may be related to the high atomic ordering along c-axis. For alkali metal sulfate doping, the photoluminescence intensity of the samples was significantly increased when K_2SO_4, Rb_2SO_4, Cs_2SO_4 were used as dopants.

Moreover, the different cation and anion doping changed the crystal structure of the sample and affected the emission peak intensity. It could be concluded that the doping alkali metal salts could change the optical transition between tungsten and oxygen which resulted in the photoluminescence intensity of the samples. Alkali metal sulfates except for Li and Na and alkali metal nitrates except Li could enhance the photoluminescence of the samples.