

MICROWAVE SYNTHESIS OF LAMP PHOSPHORS

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Various lamp phosphors are synthesized by a microwave processing technique in a multimode microwave furnace operating at 2.45 GHz. The phosphors include $[\text{Ca}_{10}(\text{PO}_4)_6(\text{Cl},\text{F}):\text{Sb}:\text{Mn}]$, $(\text{Y},\text{Eu})_2\text{O}_3$, $\text{BaMgAl}_{10}\text{O}_{17}:\text{Eu}$, and $(\text{La},\text{Ce})\text{PO}_4:\text{Ce}:\text{Tb}$, with or without flux. The microwave-synthesized phosphors are comprehensively characterized for particle size, specific surface area, brightness, and luminescent properties. The properties of the microwave-synthesized phosphors are comparable to that of the conventional products. However, the kinetics of the phosphor synthesis is substantially enhanced in the microwave processing. Usually, the same reaction can be finished at a temperature 100 to 200°C lower than in the conventional process. Besides, the soaking time at the final temperature is reduced by up to 90% compared to a conventional process. In some cases, microwave processing also produces phosphors with special properties. For example, the thermal stability of the microwave synthesized $(\text{La},\text{Ce})\text{PO}_4:\text{Ce}:\text{Tb}$ is significantly better than conventional product. This study demonstrates many advantages of microwave processing over the traditional process in phosphor synthesis.