Crystallinity and Photoluminescence Improvement of YAG:Ce Phosphor Ceramics by Solid State Reaction with Silica Addition
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Phosphor ceramics of Y₃Al₅O₁₂:Ce (YAG:Ce) were prepared by a solid state reaction method of powder firing and bulk sintering at 1500°C for 12h and 24h, respectively, which were also added with various amounts of silica (SiO₂, 0-10wt%) at different heat treatment stages to improve their crystallinity and photoluminescence property. The adding processes included a mixture of raw materials of Y₂O₃, Al₂O₃, SiO₂, Ce(NO₃)₃ (process A) prior to powder firing, a mixture of intermediate materials of Y₃Al₅O₁₂:Ce, SiO₂ (process B) prior to bulk sintering, and a combination of the above processes (process C). The results of photoluminescence and quantum efficiency indicated that the process B was superior to the other processes. This improvement was ascribed to the sufficient eutectic reaction of Y₃Al₅O₁₂:Ce and SiO₂ with less reaction energy and fewer impurities compared to process A and process C, respectively. Details of experiment processes, results and discussion will be presented in the meeting.