A002

Effect of Annealing Temperature on Growth Particles of YAG: Ce+3 Phosphor and White Light Chromaticity Values

Husnen R. Abd[1,*], Z. Hassan[2], Naser M. Ahmed[1], A. F. Omar[1], Munirah Abdullah Almessiere[3], Forat H. Alsultany[1]

[1]School of Physics, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia
[2]Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia, 11800 USM, Penang, Malaysia
[3] Physics department University of Dammam, Saudi Arabia
* Corresponding author email: husnen1978@gmail.com

In the present work, white-emitting $Y_3Al_5O_{12}$:xCe^3 (x = 0.04) nanophosphor, in the form of powder, were synthesized by a novel technique that uses continuous wave–CO_2 laser-induced solution combustion synthesis (LISCS, 40 W) using metal nitrates as precursors and urea as fuel. By covering blue light-emitting diodes (blue-LED, 445 nm), white light emission (WLED) was generated. The annealing temperature with fixed time (5 h) for phosphor powder was optimized and found to be 1050 °C. The crystallinity, structure, luminescent properties and chromaticity were characterized by X-ray diffraction (XRD), field emission-scanning electron microscope (FE-SEM), transmission electron microscopy (TEM), photoluminescence emission (PLE), electroluminescence (EL) and standard CIE 1931 chromaticity diagram, respectively. The results show that the obtained YAG:Ce^{+3} phosphor annealed at 1050 °C has good crystallinity with pure phase, low agglomeration with spherical shaped particles and strong yellow emission, offering cool-white LED with tuneable correlated color temperature (CCT) and a good color rendering index (CRI) compared to those prepared by annealing at 950 °C, 850 °C and as-prepared phosphor powders.

Keywords: White LED, continuous wave–CO_2 laser method, YAG:Ce^{+3} particles, annealing temperature, chromaticity.