Improved synthesis of YAG nanophosphors for light emitting diodes

DAVID WINARSKI, ANTHONY COLOSIMO, Bowling Green State University, AMIN KHAMECHI, Washington State University, FARIDA SELIM, Bowling Green State University — Ce-doped YAG (CeYAG) is an excellent phosphor for blue light emitting diodes (LED) with unique properties including strong absorption at the blue LED wavelength, broad-band yellow emission and high quantum efficiency. CeYAG phosphors synthesized by simple chemical methods would reduce cost and enhance performance. In this work, we synthesize YAG nanophosphors using the sol-gel method. It is obvious that the use of nano-phosphors instead of large grain-sized phosphors should reduce light scattering. YAG and CeYAG precursors were prepared using metal nitrates with various chemical agents and photo-irradiation and then converted to a gel and then solid by a series of heat treatments. Polymerization agents and photo-irradiation are investigated for their effects on YAG particle size and luminescence. The use of photo-irradiation led to the formation of a pure YAG phase at relatively low temperatures. In addition, photo-irradiation and polymerization agents slightly reduced particle size. X-ray induced luminescence spectroscopy was applied to examine the luminescence efficiency of CeYAG nanocrystals, revealing a strong luminescence at 525nm.