Effect of organic additives on morphology and upconversion properties of Y_2O_3:Ho/Yb prepared by spray pyrolysis

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The upconversion emission properties of Upconversion (UC) phosphors strongly depend on host compositions, particle size and morphology. The criteria of host materials include low vibration frequencies, thermal and chemical stabilities, hardness, and short donor-accepter distance.Y_2O_3:Ho^{3+}/Yb^{3+} is known to have intense green emission under 980 nm excitation. The emission properties of phosphor particles are largely affected by synthetic methods due to the difference in particle morphology, particle size, crystallinity and activator distribution. Spray pyrolysis has advantages in terms of controlling the particle morphology and crystallinity or achieving uniform distribution of activators in host matrix. In this work, Y_2O_3:Ho^{3+}/Yb^{3+} particles were synthesized by spray pyrolysis, and the particle morphology and upconversion properties were investigated by introducing various organic additives to the spray solution. Finally, a proper organic additive to achieve high upconversion emission was determined, and the emission intensity of Y_2O_3:Ho^{3+}/Yb^{3+} was found to be largely improved by using the chemical additives due to the densification and improvement of crystallinity.