Improved upconversion emission of Er/Yb-doped (Ti,Si)O_2 composites prepared by spray pyrolysis

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Recently, upconversion materials have received much attention as security materials. In order for luminous materials to be competitive in the security materials market to prevent counterfeiting, it is necessary to develop a cheaper and more chemically stable fluorescent material. Given this, titania is an excellent fluorescent mother body. Titania has two main crystal phases, anatase and rutile. The anatase phase is better than the rutile one in order to achieve a higher luminous intensity. It is also recommended to calcine the phosphor materials at higher temperatures to increase its crystallinity which is one of key factors affecting the emission intensity. In this study, Er/Yb doped titania spherical particles were synthesized using the spray pyrolysis method. To keep anatase phase at a higher calcination temperature is one way to increase the upconversion efficiency. To prove this, in this work, a (Ti, Si)O_2 composite was examined as a host. The crystal phase and upconversion emission were examined by changing the Si content and the calcination temperature. Finally, the Er/Yb-doped (Ti,Si)O_2 composite showed an improved upconversion.