

## Influence of Al<sup>3+</sup> and P<sup>5+</sup> ion contents on the valence state of Yb<sup>3+</sup> ions and the dispersion effect of Al<sup>3+</sup> and P<sup>5+</sup> ions on Yb<sup>3+</sup> ions in silica glass.

### Autorzy

Shiwei Wang  
Fengguang Lou  
Chunlei Yu  
Qinling Zhou  
Meng Wang  
Suya Feng  
Danping Chen

Hu Lili

Wei Chen

Małgorzata Guzik

Georges Boulon

### Rok wydania

2014

### Czasopismo

Journal of Materials  
Chemistry C

### Numer woluminu

2

### Strony

4406-4414

### DOI

10.1039/C3TC32576H

### Kolekcja

Naukowa

### Streszczenie

Three series of Yb<sup>3+</sup>-doped silica glasses containing different amounts of Al<sub>2</sub>O<sub>3</sub> and P<sub>2</sub>O<sub>5</sub> were prepared successfully by using a sol-gel method. Absorption, excitation and fluorescence spectra of Yb<sup>2+</sup> ions in these silica glasses as well as X-ray photoelectron spectra (XPS) of Yb4d were recorded and analysed systematically. It is found out that the addition of Al<sup>3+</sup> or P<sup>5+</sup> ions has great influence on the redox state of ytterbium ions. With increasing Al<sup>3+</sup> ion contents in these silica glasses, more trivalent Yb<sup>3+</sup> ions are reduced to divalent Yb<sup>2+</sup>. In contrast, the increase of P<sup>5+</sup> ion contents greatly promotes divalent Yb<sup>2+</sup> ions to be oxidized to trivalent Yb<sup>3+</sup>. The possible redox mechanisms have been explored and discussed in detail. The influence of Al<sup>3+</sup> and P<sup>5+</sup> ion contents on the near-infrared luminescence intensity of Yb<sup>3+</sup> ions and cooperative luminescence of Yb<sup>3+</sup> ion pairs was also discussed. Both the near-infrared luminescence intensity of Yb<sup>3+</sup> ions and cooperative luminescence of Yb<sup>3+</sup> ion pairs decrease gradually with increasing Al<sup>3+</sup> and P<sup>5+</sup> ion contents. The decrease of cooperative luminescence of Yb<sup>3+</sup> ion pairs indicates a good dispersion effect of Al<sup>3+</sup> and P<sup>5+</sup> ions on Yb<sup>3+</sup> ions in Yb<sup>3+</sup>-doped silica glass. The results are useful for optimization of fabrication of the high quality Yb<sup>3+</sup>-doped silica fiber by the composite design of Yb-Al-P co-doped silica glass.

### Adres publiczny

<http://dx.doi.org/10.1039/C3TC32576H>

### Strona internetowa wydawcy

<https://www.rsc.org/>

Język

---

Angielski

Typ publikacji

---

Artykuł

Plik został wygenerowany dnia 2021-07-27 20:54:42

Adres w repozytorium <https://chem.uni.wroc.pl/repozytorium/p0RU1ry>.