Electronic Supplementary Material (ESI) for Dalton Transactions

Electronic Supplementary Information

YF_3: Ln^{3+} (Ln = Ce, Tb, Pr) submicrospindles: hydrothermal synthesis and luminescence properties

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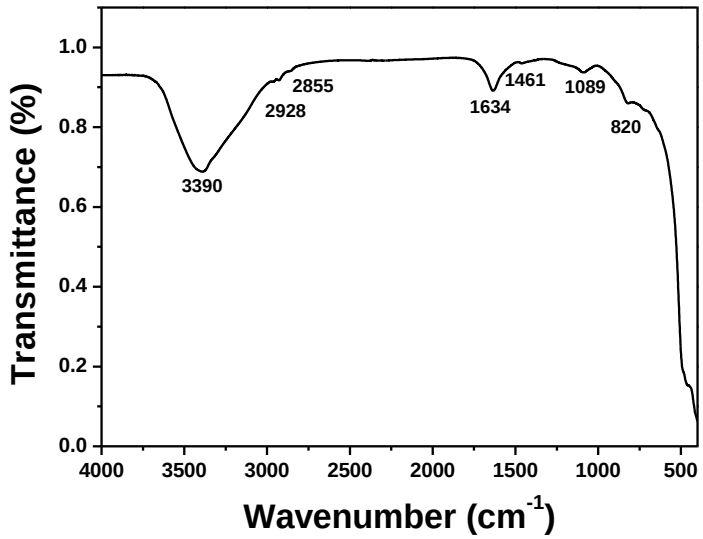

Fig. S1 FTIR spectrum of as-prepared YF_3:0.02Ce^{3+} microspindles.

The FTIR spectroscopy of YF_3:0.02Ce^{3+} microspindles in Fig. 2d was performed (Fig. S1). The broad absorption band at 3390 cm^{-1} is ascribed to the O–H stretching vibration. The 2928 and 2855 cm^{-1} transmission bands are assigned to the asymmetric (ν_{as}) and symmetric (ν_s) stretching vibrations of methylene (CH_2) in the Cit^{3-} molecule, respectively. The bands at 1634 and 1461 cm^{-1} can be assigned to the asymmetric (ν_{as}) and symmetric (ν_s) stretching vibrations of the carboxylic group ($–COO^–$), respectively. Although the as-prepared sample was washed several times with water and ethanol, there were still some organic molecules Cit^{3-} on the surface of the particles. Moreover, two absorption peaks corresponding to polyborate group $B_3O_9^{9-}$ were observed. According to previous reports,[1-3] we consider the FTIR absorption

peak at 820 cm^{-1} to be of ring stretch vibration modes and the peak at 1089 cm^{-1} to be of terminal stretch vibration modes. Although the absorption peaks of polyborate group can be observed, the XRD results indicate that no impurity was formed in YF_3 products. It is reasonable that these polyborate groups were on the surface of the particles, like Cit^{3-}.

Calculating method for spectral overlap

The spectra overlap between excitation and emission spectra were calculated by Origin software. The calculation process can be described as follows. Taking the emission spectrum of Ce^{3+} for example, firstly, selected the overlapping part of emission spectrum, in our experiments, that was the spectrum in the range from 275 to 450 nm. Transformed the unit of X axis from nm to eV using the formula: $E = 1240/\lambda(nm)$. Then plotted the data and integrated the area of the spectrum. Divided the Y axis by the above value of area, and the $F_S(E)$ can be obtained. The overlapping part of the excitation spectrum of Tb^{3+} was disposed by the same procedure to get the $F_A(E)$. Using $F_S(E)F_A(E)/E^4$ as new Y axis, integrated, and the value of $\int F_S(E)F_A(E)\mathrm{d}E/E^4$ can be obtained finally.

Reference

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2. Z. G. Wei, L. D. Sun, C. S. Liao, J. L. Yin, X. C. Jiang and C. H. Yan, *J. Phys. Chem. B*, 2002, **106**, 10610.

3. Y. F. Xu, D. K. Ma, X. Chen, D. P. Yang and S. M. Huang, *Langmuir*, 2009, **25**, 7103.