Electronic Supplementary Information

# The Luminescence of Ion-exchangeable Defect Pyrochlore $KNbWO_6 \cdot H_2O:xEu^{3+}$

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The composition of the products is determined by EDX using a HITACHI SU8020 electron microscope equipped with Bruker spectrometer operating at 20 kV.

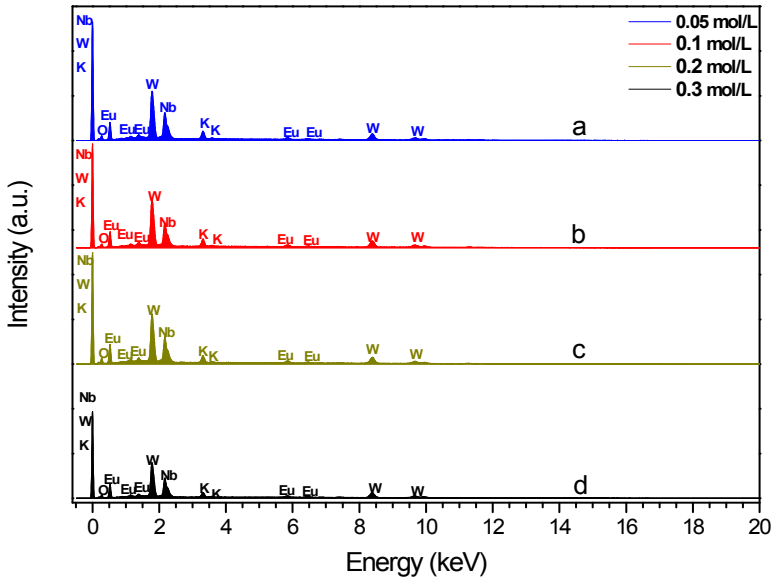


**Figure S1** EDX spectra of $KNbWO_6 \cdot H_2O:xEu^{3+}$ prepared in $Eu(NO_3)_3$ solution of (a) 0.05 mol/L, (b) 0.1mol/L, (c) 0.2mol/L, and (d) 0.3 mol/L.

| Element / Atom% / $C_{Eu3+}$(mol/L) | O | Nb | W | K | Eu |
|---|---|---|---|---|---|
| **0.05** | 76.02 | 9.92 | 8.47 | 4.50 | 1.10 |
| **0.1** | 74.09 | 9.93 | 9.87 | 4.81 | 1.30 |
| **0.2** | 76.12 | 9.40 | 9.16 | 3.94 | 1.38 |
| **0.3** | 73.65 | 10.88 | 9.78 | 3.84 | 1.84 |

The x value of $KNbWO_6 \cdot H_2O:xEu^{3+}$ is determined by normalized of the Eu component to the average value of Nb and W components in the product. For example, The x value of $KNbWO_6 \cdot H_2O:xEu^{3+}$ prepared in 0.1 mol/L $Eu(NO_3)_3$ solution is determined as 1.30/(9.93/2+9.87/2)=0.131. So, the x value of $KNbWO_6 \cdot H_2O:xEu^{3+}$ prepared in $Eu(NO_3)_3$ solution of 0.05, 0.1, 0.2, and 0.3 mol/L are determined as 0.120, 0.131, 0.149, and 0.178, respectively.

$KNbWO_6 \cdot H_2O:xEu$ is difficult to be dissolved. But we find that $Eu^{3+}$ in $KNbWO_6 \cdot H_2O:xEu$ can be exchanged in concentrated nitric acid under hydrothermal conditions. $Eu^{3+}$ in $KNbWO_6 \cdot H_2O:xEu$ can be determined by ICP after treating the

samples in concentrated nitric acid under hydrothermal conditions. The details are as follow:

50.00 mg $KNbWO_6 \cdot H_2O$:xEu is treated in 30mL 3M $HNO_3$ at 180 °C for 24h under hydrothermal condition. This process is repeated 4 times to make sure that $Eu^{3+}$ can be completely removed from $KNbWO_6 \cdot H_2O$:xEu. The solution is collected for ICP measurement. According to the ICP result, the doping composition of $Eu^{3+}$ are 0.115, 0.127, 0.143, 0.170 for the products obtained in $Eu(NO_3)_3$ solution of 0.05, 0.1, 0.2, and 0.3 mol/L, respectively. This result is consistent with that of EDX. The deviation (less than 5%) between the results of EDX and ICP probably due to that $Eu^{3+}$ cannot be completely removed from $KNbWO_6 \cdot H_2O$:xEu. The EDX result indicates that there is still ca. 1% $Eu^{3+}$ residual after four time hydrothermal treatments.