Morphology/phase controllable synthesis of monodisperse ScVO$_4$ microcrystals and tunable multicolor luminescent properties in Sc(La)VO$_4$(PO$_4$):Bi$^{3+}$,Ln$^{3+}$ phosphors

Dingyi Shen$^a$, Yufeng Zhang$^a$, Xuemei Zhang$^a$, Zhenling Wang$^b$, Yanfei Zhang$^c$, Shanshan Hu$^a$ and Jun Yang$^a$*

$^a$ School of Chemistry and Chemical Engineering, Southwest University, Chongqing 400715, China. E-mail: jyang@swu.edu.cn and hushan3@swu.edu.cn

$^b$ The Key Laboratory of Rare Earth Functional Materials and Applications, Zhoukou Normal University, Zhoukou City, 466001, China.

$^c$AECC Harbin Dongan Engine Co Ltd, Harbin, 150066, China.

Table S1 Summary of the photoluminescence properties of ScVO$_4$:6%Ln$^{3+}$ (Ln = Sm, Eu, Sm, Dy, Ho, Er and Tm) microcrystals under 278nm excitation.

<table>
<thead>
<tr>
<th>No.</th>
<th>Emission peaks (nm)</th>
<th>Emission transition</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>ScVO$_4$:6%Sm$^{3+}$</td>
<td>498</td>
</tr>
<tr>
<td></td>
<td></td>
<td>569</td>
</tr>
<tr>
<td></td>
<td></td>
<td>607</td>
</tr>
<tr>
<td></td>
<td></td>
<td>651</td>
</tr>
<tr>
<td>b</td>
<td>ScVO$_4$:6%Eu$^{3+}$</td>
<td>599</td>
</tr>
<tr>
<td></td>
<td></td>
<td>619</td>
</tr>
<tr>
<td>c</td>
<td>ScVO$_4$:6%Dy$^{3+}$</td>
<td>485</td>
</tr>
<tr>
<td></td>
<td></td>
<td>579</td>
</tr>
<tr>
<td>d</td>
<td>ScVO$_4$:6%Ho$^{3+}$</td>
<td>502</td>
</tr>
<tr>
<td></td>
<td></td>
<td>548</td>
</tr>
<tr>
<td>e</td>
<td>ScVO$_4$:6%Er$^{3+}$</td>
<td>528</td>
</tr>
<tr>
<td></td>
<td></td>
<td>549,559</td>
</tr>
<tr>
<td>f</td>
<td>ScVO$_4$:6%Tm$^{3+}$</td>
<td>478</td>
</tr>
</tbody>
</table>
**Table S2** Emission peaks and FWHM of Sc(VO$_4$)$_{1-x}$(PO$_4$)$_x$:1% Bi$^{3+}$ ($x = 0, 0.2, 0.4, 0.6, 0.8, 1$).

<table>
<thead>
<tr>
<th>No.</th>
<th>Compounds</th>
<th>$E_m$/nm</th>
<th>FWHM/nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sc(VO$_4$):1%Bi$^{3+}$</td>
<td>560</td>
<td>93</td>
</tr>
<tr>
<td>2</td>
<td>Sc(VO$<em>4$)$</em>{0.8}$(PO$<em>4$)$</em>{0.2}$:1%Bi$^{3+}$</td>
<td>550</td>
<td>107</td>
</tr>
<tr>
<td>3</td>
<td>Sc(VO$<em>4$)$</em>{0.6}$(PO$<em>4$)$</em>{0.4}$:1%Bi$^{3+}$</td>
<td>541</td>
<td>122</td>
</tr>
<tr>
<td>4</td>
<td>Sc(VO$<em>4$)$</em>{0.4}$(PO$<em>4$)$</em>{0.6}$:1%Bi$^{3+}$</td>
<td>502</td>
<td>152</td>
</tr>
<tr>
<td>5</td>
<td>Sc(VO$<em>4$)$</em>{0.2}$(PO$<em>4$)$</em>{0.8}$:1%Bi$^{3+}$</td>
<td>470</td>
<td>220</td>
</tr>
<tr>
<td>6</td>
<td>ScPO$_4$:1%Bi$^{3+}$</td>
<td>376</td>
<td>81</td>
</tr>
</tbody>
</table>
Fig. S1 Magnified the XRD patterns of the as-prepared ScVO$_4$ samples formed in the presence of different amount of PEG. The relative intensity ratio of (004)/(303) increases a little with the increase of PEG from 0 to 0.25 g, which is consistent with structural alterations in Figure 6g.
Fig. S2 The CIE chromaticity coordinates of ScVO$_4$:6%Sm$^{3+}$ (A), 6%Eu$^{3+}$ (B), 6%Dy$^{3+}$ (C), 6%Ho$^{3+}$ (D), 6%Er$^{3+}$ (E), 6%Tm$^{3+}$ (F), respectively.