Preparation of White Light Emitting YVO₄: Ln³⁺ and Silica-coated YVO₄: Ln³⁺
(Ln³⁺ = Eu³⁺, Dy³⁺, Tm³⁺) Nanoparticles by CTAB/n-butanol/hexane/water
Microemulsion Route: Energy Transfer and Site Symmetry Studies

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**Table S1.** V-O charge transfer in the excitation spectra of YVO$_4$:Ln$^{3+}$ and YVO$_4$:Ln$^{3+}$@SiO$_2$ (Ln$^{3+}$ = Eu$^{3+}$, Tm$^{3+}$ and Dy$^{3+}$) at different annealing temperatures.

**Table S2.** Integrated Area and Full width half maximum (FWHM) of the electric and magnetic dipole transition of the emission spectra of Ln$^{3+}$:YVO$_4$ and Ln$^{3+}$:YVO$_4$@SiO$_2$ (Ln$^{3+}$ = Eu$^{3+}$, Tm$^{3+}$ and Dy$^{3+}$) at different annealing temperatures.

**Table S3.** Lifetime values (mono-exponential fitting) for Ln$^{3+}$ (Ln$^{3+}$ = Eu$^{3+}$, Tm$^{3+}$ and Dy$^{3+}$) in YVO$_4$:Ln$^{3+}$ and YVO$_4$:Ln$^{3+}$@SiO$_2$ at different annealing temperatures.

**Fig. S1** XRD patterns of YVO$_4$:Ln$^{3+}$ (Ln$^{3+}$ = Eu$^{3+}$, Dy$^{3+}$, Tm$^{3+}$) at different annealing temperatures (500 and 900 °C).

**Fig. S2** XRD patterns of YVO$_4$:Ln$^{3+}$@SiO$_2$ (Ln$^{3+}$ = Eu$^{3+}$, Dy$^{3+}$, Tm$^{3+}$) at different annealing temperatures (500, 700 and 900 °C).

**Fig. S3** TGA curve of as-prepared YVO$_4$ collected from CTAB/n-butanol/hexane/water microemulsion.

**Fig. S4** TEM images of YVO$_4$:Tm$^{3+}$@SiO$_2$ annealed at (a) 500 and (b) 900°C. Inset of (b) shows the SAED (Upper) and HRTEM (Lower).

**Fig. S5** Luminescence decay of YVO$_4$:Ln$^{3+}$ (Ln$^{3+}$ = Eu$^{3+}$, Dy$^{3+}$ and Tm$^{3+}$) at different annealing temperatures (500 and 900 °C).

**Fig. S6** Luminescence decay of YVO$_4$:Ln$^{3+}$@SiO$_2$ (Ln$^{3+}$ = Eu$^{3+}$, Dy$^{3+}$ or Tm$^{3+}$) at different annealing temperatures (500 and 900 °C).

**Fig. S7** Luminescence decay of YVO$_4$:Ln$^{3+}$@SiO$_2$ (Ln$^{3+}$ = Eu$^{3+}$, Dy$^{3+}$ and Tm$^{3+}$) at different annealing temperatures (500 and 900 °C).
Table S1. V-O charge transfer in the excitation spectra of YVO₄:Ln³⁺ and YVO₄:Ln³⁺@SiO₂ (Ln³⁺ = Eu³⁺, Tm³⁺ and Dy³⁺) at different annealing temperatures.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Sample</th>
<th>V-O Charge transfer (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eu:YVO₄ – 500 °C</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>Eu:YVO₄ – 900 °C</td>
<td>318</td>
</tr>
<tr>
<td>3</td>
<td>Eu:YVO₄@SiO₂ – 500 °C</td>
<td>290</td>
</tr>
<tr>
<td>4</td>
<td>Eu:YVO₄@SiO₂ – 900 °C</td>
<td>307</td>
</tr>
<tr>
<td>5</td>
<td>Dy:YVO₄ – 500 °C</td>
<td>300</td>
</tr>
<tr>
<td>6</td>
<td>Dy:YVO₄ – 900 °C</td>
<td>320</td>
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<tr>
<td>7</td>
<td>Dy:YVO₄@SiO₂ – 500 °C</td>
<td>300</td>
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<td>8</td>
<td>Dy:YVO₄@SiO₂ – 900 °C</td>
<td>306</td>
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<td>9</td>
<td>Tm:YVO₄ – 500 °C</td>
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<tr>
<td>10</td>
<td>Tm:YVO₄ – 900 °C</td>
<td>320</td>
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<tr>
<td>11</td>
<td>Tm:YVO₄@SiO₂ – 500 °C</td>
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<td>Tm:YVO₄@SiO₂ – 900 °C</td>
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<td>Sl. No.</td>
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<td>Integrated area (nm)</td>
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<td>2</td>
<td>Eu:YVO$_4$ – 900 °C</td>
<td>4.4 x 10$^5$</td>
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<td>3</td>
<td>Eu:YVO$_4$ @SiO$_2$ – 500 °C</td>
<td>3.5 x 10$^5$</td>
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<td>Eu:YVO$_4$ @SiO$_2$ – 900 °C</td>
<td>1.6 x 10$^7$</td>
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<td>5</td>
<td>Dy:YVO$_4$ – 500 °C</td>
<td>1.6 x 10$^5$</td>
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<tr>
<td>6</td>
<td>Dy:YVO$_4$ – 900 °C</td>
<td>3.9 x 10$^5$</td>
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<td>Dy:YVO$_4$ @SiO$_2$ – 500 °C</td>
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<td>Dy:YVO$_4$ @SiO$_2$ – 900 °C</td>
<td>1.3 x 10$^6$</td>
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<td>1.1 x 10$^4$</td>
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<td>11</td>
<td>Tm:YVO$_4$ @SiO$_2$ – 500 °C</td>
<td>1.9 x 10$^4$</td>
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<tr>
<td>12</td>
<td>Tm:YVO$_4$ @SiO$_2$ – 900 °C</td>
<td>6.3 x 10$^5$</td>
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Table S3. Lifetime values obtained after the mono-exponential fitting to the data of YVO₄:Ln³⁺ and YVO₄:Ln³⁺@SiO₂ (Ln³⁺ = Eu³⁺, Tm³⁺ and Dy³⁺) at different annealing temperatures.

<table>
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<tr>
<th>Sl. No.</th>
<th>Sample</th>
<th>Lifetime, τ (µs)</th>
<th>R² (Goodness of parameter)</th>
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<td>1.</td>
<td>Tm:YVO₄ – 500 °C</td>
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<td>2.</td>
<td>Tm:YVO₄ – 900 °C</td>
<td>16.3</td>
<td>0.991</td>
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<td>3.</td>
<td>Eu:YVO₄ – 500 °C</td>
<td>149.9</td>
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<td>Eu:YVO₄ – 900 °C</td>
<td>475.4</td>
<td>0.998</td>
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<td>5.</td>
<td>Dy:YVO₄ – 500 °C</td>
<td>84.6</td>
<td>0.987</td>
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<td>6.</td>
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<td>109.1</td>
<td>0.999</td>
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<td>Tm:Eu:Dy:YVO₄ – 500 °C (Tm)</td>
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<td>0.974</td>
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<td>Tm:Eu:Dy:YVO₄ – 500 °C (Eu)</td>
<td>16.8</td>
<td>0.996</td>
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<td>9.</td>
<td>Tm:Eu:Dy:YVO₄ – 500 °C (Dy)</td>
<td>4.9</td>
<td>0.979</td>
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<td>0.977</td>
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<td>Tm:YVO₄@SiO₂ – 500 °C</td>
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<td>14.</td>
<td>Tm:YVO₄@SiO₂ – 900 °C</td>
<td>21.1</td>
<td>0.998</td>
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<td>15.</td>
<td>Eu:YVO₄@SiO₂ – 500 °C</td>
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<td>Eu:YVO₄@SiO₂ – 900 °C</td>
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<td>0.998</td>
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<td>17.</td>
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<td>24.</td>
<td>Tm:Eu:Dy:YVO₄@SiO₂ – 900 °C (Dy)</td>
<td>11.9</td>
<td>0.959</td>
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</tbody>
</table>
Fig. S1 XRD patterns of YVO$_4$:Ln$^{3+}$ ($\text{Ln}^{3+} = \text{Eu}^{3+}$, Dy$^{3+}$, Tm$^{3+}$) at different annealing temperatures (500 and 900 °C).
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