Fig. S1 FT-IR spectra of the assembled spheres $Y_{1-x}HoxVO_4$ (a) and (b) $Y_{0.99-x}Bi_{0.01}HoxVO_4$ ($x=0.05$).

Fig. S2 XRD patterns of $Y_{0.99}Bi_{0.01}VO_4$ prepared using (a) 2 mL deionized water and (b) 2 mL ethylene glycol to dissolve Bi(NO$_3$)$_3$. Vertical bars represent the standard diffraction data for bulk YVO$_4$. The presence of a second minor phase $\alpha$-Bi$_2$O$_3$ was detected in the sample prepared directly using deionized water to dissolve Bi(NO$_3$)$_3$. May be the following chemical reaction occurs: $2\text{Bi(NO}_3)_3 + 6\text{OH}^- \rightarrow \text{Bi}_2\text{O}_3 + 6\text{NO}_3^- + 3\text{H}_2\text{O}$ (basic medium).
**Fig. S3** EDS data of the assembled spheres Y$_{0.99-x}$Bi$_{0.01}$Ho$_x$VO$_4$ (x=0.05).

**Fig. S4** CIE chromaticity diagram of Ln$^{3+}$-doped YVO$_4$ (Ln=Ho, Eu, Dy, Sm) microarchitectures when excited using a single wavelength light of 310 nm.
**Fig. S5** CIE chromaticity diagram for assembled-spheres YVO$_4$ co-doped with Ln$^{3+}$/Bi$^{3+}$ (Ln=Eu, Dy, Sm) when excited using a single wavelength light of 330 nm.

**Fig. S6** Typical UV-vis diffuse reflectance spectra for (a) YVO$_4$:Eu$^{3+}$ and (b) YVO$_4$:Eu$^{3+}$/Bi$^{3+}$. 
**Fig. S7** Excitation (dash line) and emission spectra (solid line) of the assembled spheres YVO$_4$.

**Fig. S8** Excitation (dash line) and emission spectra (solid line) of the assembled spheres YVO$_4$:Bi$^{3+}$.