Supporting Information

Intentional Anion Incorporation to Rational Modulate Size, Shape and Optical Property of Lanthanide Oxide Nanocrystals

Zhenlan Fang, Fangyu Zhao, Yuwei Zhang, Weilinsen Ding, Lantian Zhang, Meili Liu, Wenlong Xu, Kedar Bahadur Thapa, Wei Huang, Qiang Ju*

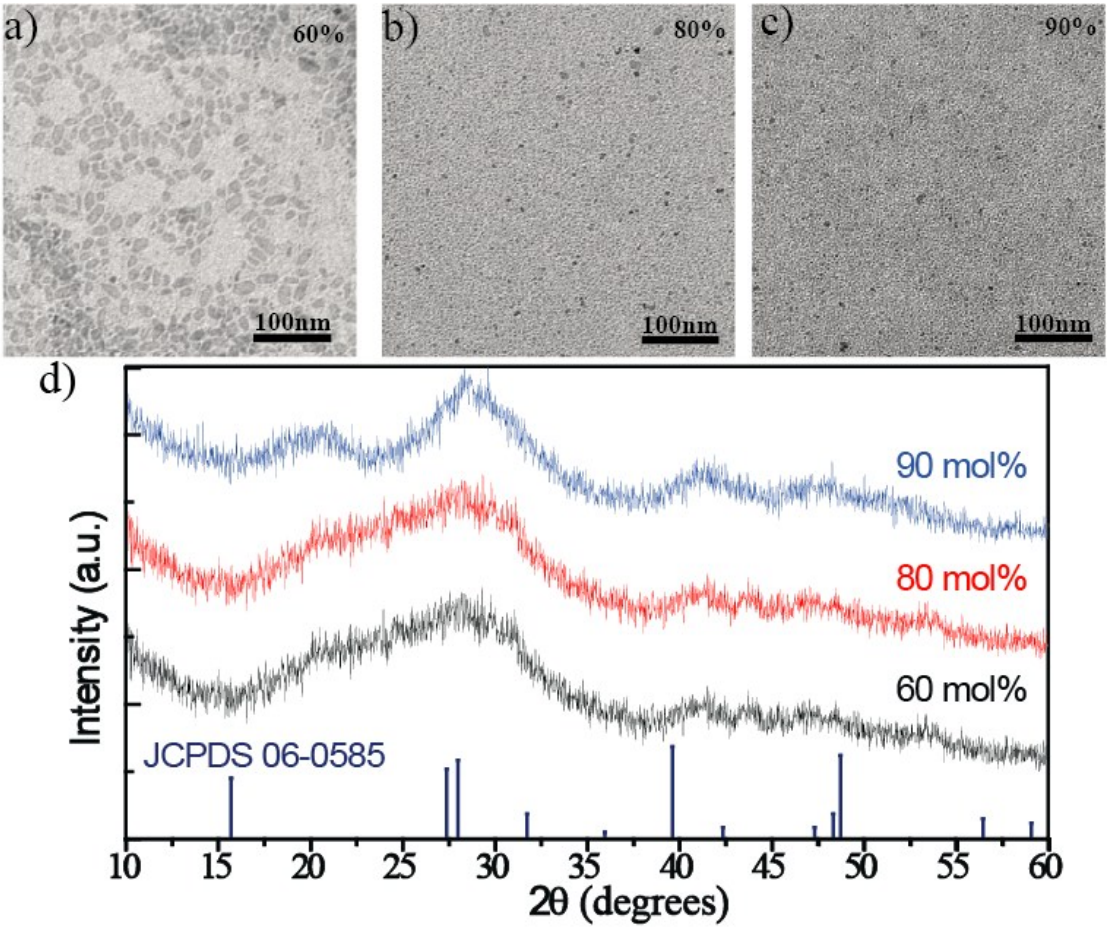

Figure S1. TEM images of $LaVO_4$ nanocrystals incorporated with a) 60 mol% PO_4^{3-}, B) 80 mol% PO_4^{3-}, and c) 90 mol% PO_4^{3-}, respectively; d) XRD patterns of corresponding nanocrystals as well as $La(OH)_3$ (JCPDS standard card no. 06-0585). There were no $LaVO_4$ or $LaPO_4$ detected on the XRD patterns, and the peak position partilly overlap with that of $La(OH)_3$, implying the presence of $La(OH)_3$ under this fabrication condition.

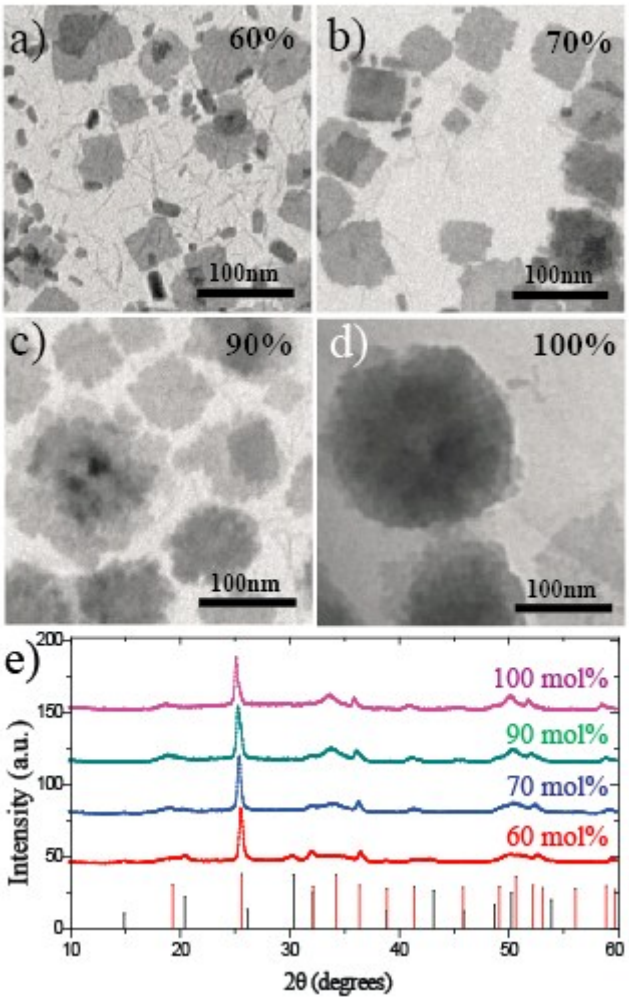

Figure S2. TEM images of $YbPO_4$ nanocrystals incorporated with a) 60 mol% VO_4^{3-}, b) 70 mol% VO_4^{3-}, b) 90 mol% VO_4^{3-}, and d) 100 mol% VO_4^{3-}, respectively; d) XRD patterns of corresponding nanocrystals as well as $YbPO_4$ (JCPDS standard card no. 54-1014, black line) and $YbVO_4$ (JCPDS standard card no. 72-0271, red line). The size of nanoparticles gradually enlarged as more VO_4^{3-} entered, and meanwhile, and XRD patterns were dominated by $YbVO_4$.

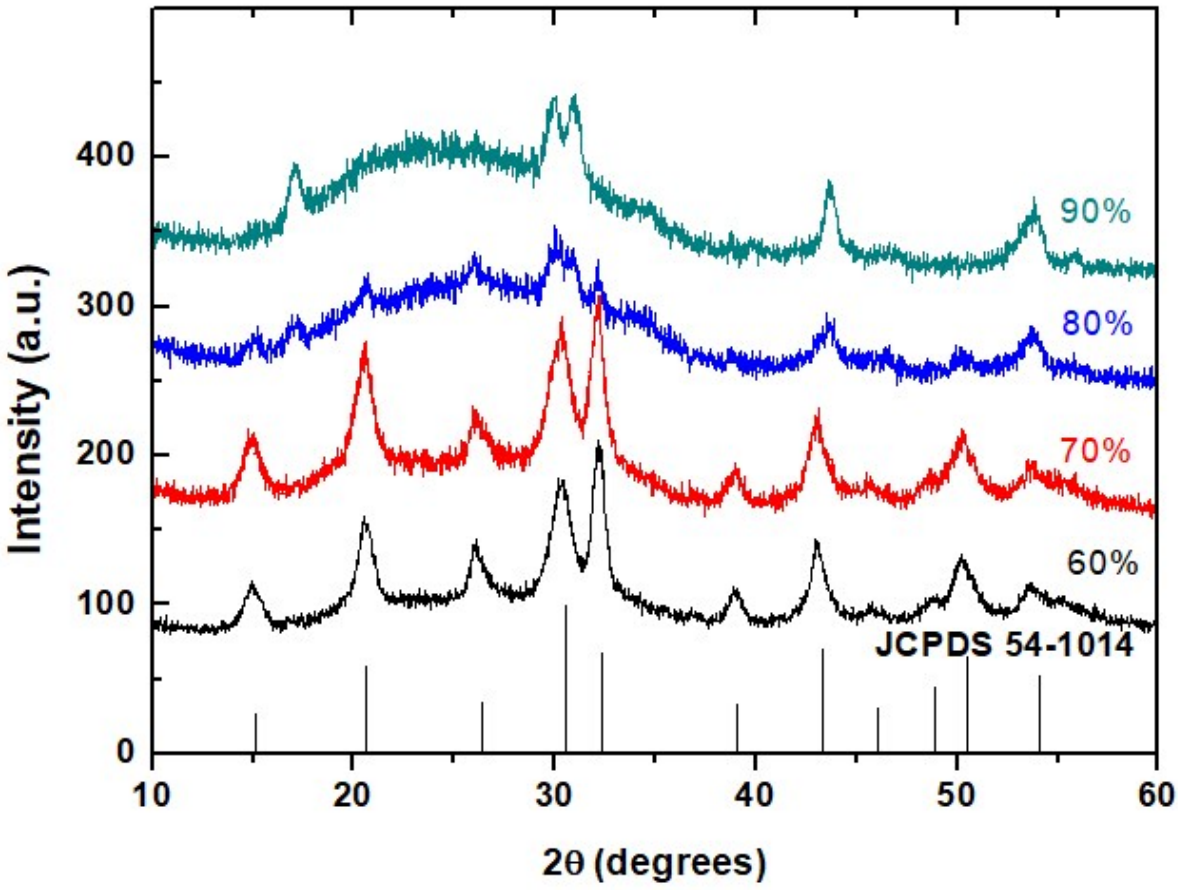

Figure S3. XRD patterns of $YbPO_4$ nanocrystals incorporated with 60 mol%, 70 mol%, 80 mol% and 90 mol% BO_3^{3-} as well as the JCPDS standard card of $YbPO_4$ (no. 54-1014), indicating that there were no crystalline $YbBO_3$ nanocrystals generated.

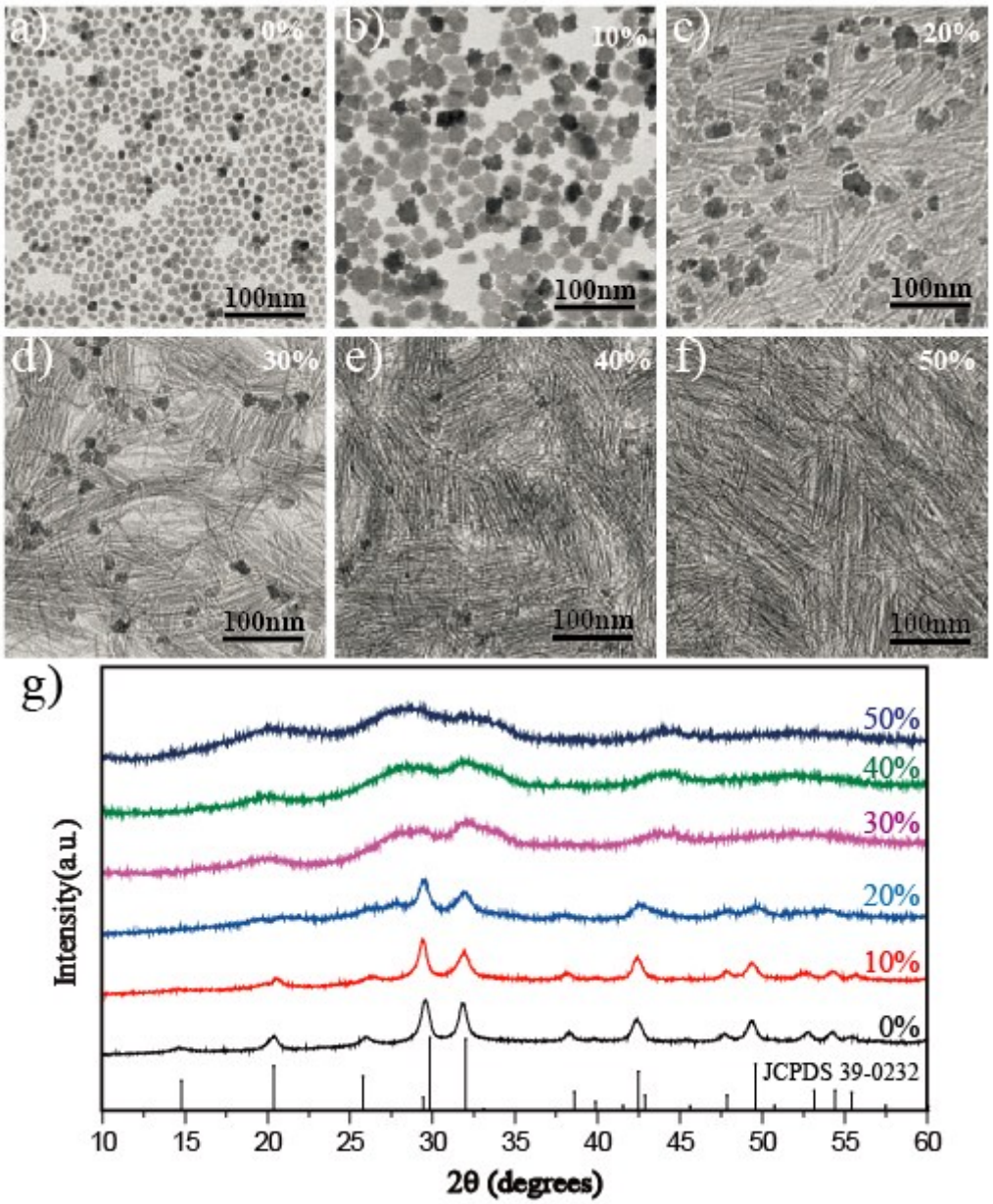

Fig. S4. TEM images of $GdPO_4$ incorporated with a) 0%, b) 10%, c) 20% d) 30%, e) 40%, and f) 50 % BO_3^{3-}; and g) XRD patterns of corresponding nanocrystals as well as $GdPO_4$ (JCPDS standard card no. 39-0232). Although there is no $GdBO_3$ detected out as shown in the XRD, the added BO_3^{3-} can effectively modify size and mophology of $GdPO_4$ nanocrystals.

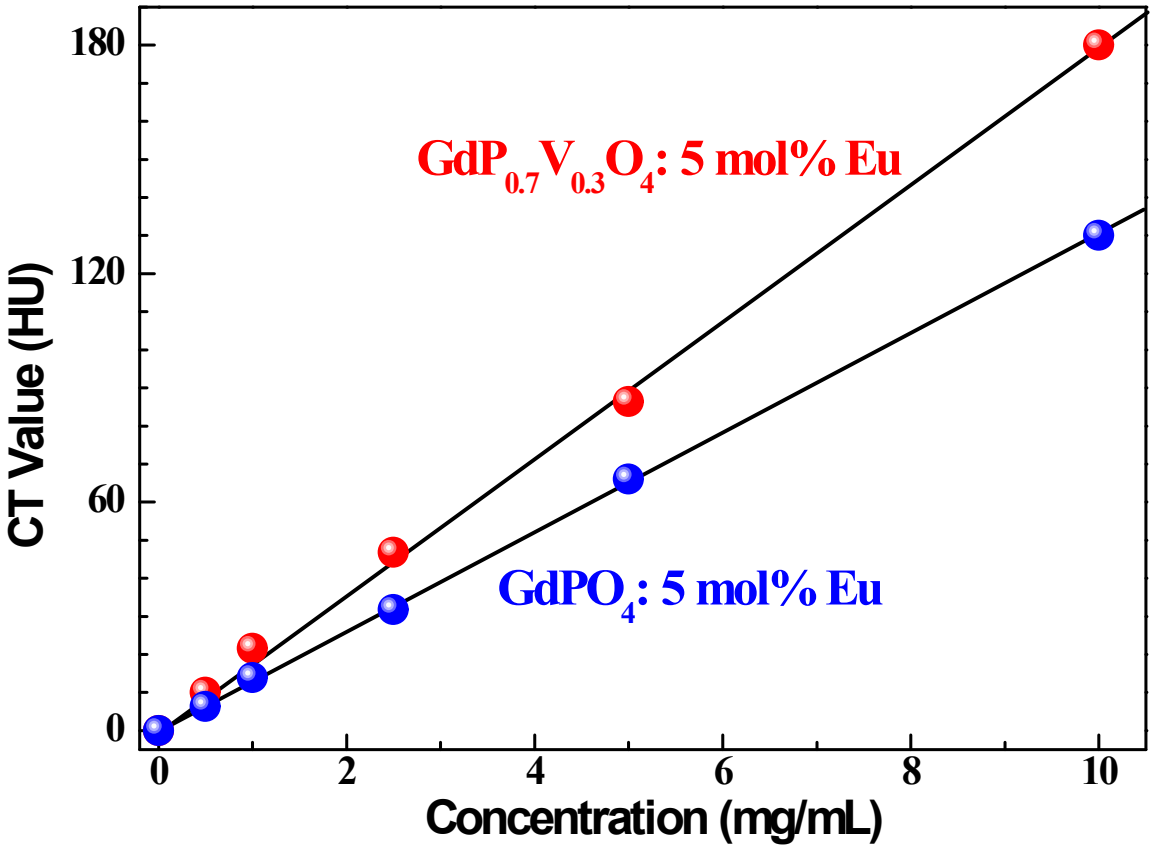

Figure S5. CT value (HU) of aqueous solution of $GdP_{0.7}V_{0.3}O_4$: 5 mol% Eu and $GdPO_4$: 5 mol% Eu nanocrystals as a function of concentration. The the CT value at a concentration of 10 mg mL^{-1} is measured to be 178.4 and 127.8 HU, respectively. This result demonstrate that the incorporation of VO_4^{3-} could significatnly improve the CT contrast capability. As Iopromide (a common used CT contrast agent in clinical application) is 135.4 HU, $GdP_{0.7}V_{0.3}O_4$: 5 mol% Eu could serve as efficient CT contrast agents.

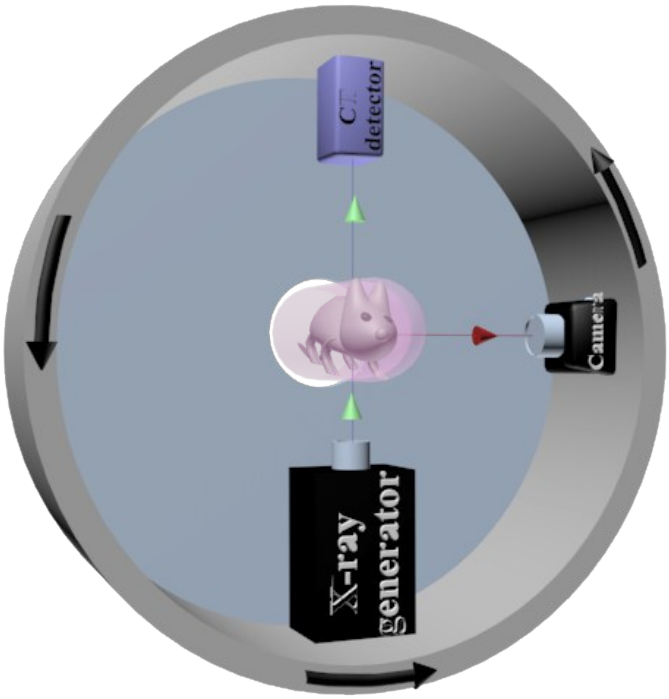

Figure S6. Schematic illustration of the simultaneous optical and CT deep tissue dual-modal imaging under the single X-ray irradiation assisted by $Gd_{0.95}Eu_{0.05}P_{0.7}V_{0.3}O_4$ nanocrystals.