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Highly efficient NIR to NIR up-conversion $CaWO_4:Tm^{3+}$, Yb^{3+} nano phosphors and its application in bio imaging of deep tumors

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$CaWO_4:Tm^{3+}$, Yb^{3+}, Li^+ nano-phosphors with intense NIR to NIR (excitation by 980 nm, emission at ~800 nm) up conversion were synthesized by a facile polyol route. The nanoparticles were of the order of ~20 to 60 nm. The XRD patterns confirmed a single-phase tetragonal scheelite structure having space group I41/a, irrespective of doping of small amounts of RE^{3+} and alkali ions. The incorporation of Li^+ ions altered the crystal field symmetry around the Tm^{3+} ions, which increased the f–f transition probabilities of the RE^{3+} ions, and thus increased the up conversion intensities. Compared with $CaWO_4:Tm^{3+}$, Yb^{3+}, the NIR to NIR up conversion emission intensity of 10 mol% Li^+ substituted $CaWO_4:Tm^{3+}$, Yb^{3+} nanocrystals increased by 20-fold and can be pumped by ~1mW power 980 CW laser. The brightest $CaWO_4:Tm^{3+}$, Yb^{3+}, Li^+ nano-phosphor was applied for non-invasively visualizing the tumors in nude mice and successfully detected deep tumors in the thigh muscles. Results were based on oxide based UCNPs used for in vivo NIR-to-NIR bio-imaging which opens the window of achieving improved features using non-fluoride based UCNPs for bio-imaging.

Biography

Bheeshma P Singh is working as SERB Indo-USA Post-doctoral fellow since January 2017 in Dept. of Chemistry at University at Buffalo, SUNY in the group of Prof. Paras N Prasad. His expertise mainly includes the nanomaterials synthesis and its bimodal applications such as efficient NIR to NIR biomarkers, ferro fluid based hybrid nanostructure for hyperthermia in cancer therapy, LEDs and all inorganic perovskite quantum dots for display applications.

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