SUPPLEMENTARY INFORMATION

Ln$^{3+}$-doped nanoparticles with enhanced NIR-II luminescence for lighting up blood vessels in mice

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Fig. S1 The quantum efficiency curves of the camera used in the fluorescent imaging experiments: InGaAs based NIRvana 640 charge coupled device (CCD). This figure is obtained from the instrument manual (Princeton Co.).

Fig. S2 XRD patterns of NaYbF$_4$:2%Er, NaYbF$_4$:2%Er,5%Ce (Er,Ce-Core), NaYbF$_4$:2%Er,5%Ce@NaYF$_4$:10%Yb (Er,Ce-CS) and NaYbF$_4$:2%Er,5%Ce@NaYF$_4$:10%Yb@NaYF$_4$:50%Nd (Er,Ce-CSS) were determined. And the standard XRD patterns of cubic phase of NaYbF$_4$ (JCPDS: 27-1426).
**Fig. S3** Fourier-transform infrared spectra of OA-Er,Ce-CSS, PAA-Er,Ce-CSS, PEG-Er,Ce-CSS and mPEG-NH$_2$ molecule.

**Fig. S4** The distribution of PEG-Er,Ce-CSS (dispersed in water).
**Fig. S5** Cell viability (%) estimated by MTT assay versus concentrations of PEG-Er,Ce-CSS after 24 h incubation at 37 °C.

**Fig. S6** The histopathology image of subcutaneous tumor. (The magnification is 200×)

**Reference:**

