Supporting Information

Dual-modal Fluorescent/Magnetic Bioprobes Based on Small Sized Upconversion Nanoparticles of Amine-functionalized BaGdF$_5$:Yb/Er

Songjun Zeng,$^{ab}$ Ming-Kiu Tsang,$^a$ Chi-Fai Chan,$^{ac}$ Ka-Leung Wong,$^c$ and Jianhua Hao$^{*a}$

$^a$Department of Applied Physics and Materials Research Center, The Hong Kong Polytechnic University, Hong Kong. E-mail: apjhao@polyu.edu.hk

$^b$Faculty of Materials, Optoelectronics and Physics, Key Laboratory of Low-dimensional Materials and Application Technology (Ministry of Education), Xiangtan University, Xiangtan 411105, People’s Republic of China.

$^c$Department of Chemistry, Hong Kong Baptist University, Hong Kong.
Figure S1. FTIR spectra of the amine-functionalized BaGdF$_5$:Yb/Er NPs.
Figure S2. EDS spectra of the amine-functionalized BaGdF$_5$:Yb/Er NPs (UCNPs-PEI).
Figure S3. The simplified energy-level diagrams of Yb\textsuperscript{3+}/Er\textsuperscript{3+} and the corresponding mechanism of upconversion emissions.