Supporting information

Figure S1 XRD patterns of zeolite Y and CdS-ZY.

Figure S2 TEM images of CdS-ZY (A, B) and Eu(phen)(o-MBA)$_3$-CdS-ZY (C, D).

**Figure S3** XRD patterns of europium or terbium complexes functionalized CdS-ZY.

**Figure S4** FTIR spectra of europium complexes functionalized CdS-ZY with three different mercaptan ranged from 1250–2000 cm$^{-1}$. 
**Figure S5** Excitation and emission spectrum of (o-MBA)-CdS-ZY, (p-MBA)-CdS-ZY (MAA)-CdS-ZY. (A) (o-MBA)-CdS-ZY excitation spectrum is obtained by monitoring the emission at 492 nm, and the excitation wavelength for the emission spectrum is 395 nm. (B) (p-MBA)-CdS-ZY excitation spectrum is obtained by monitoring the emission at 492 nm, and the excitation wavelength for the emission spectrum is 367 nm. (C) (MAA)-CdS-ZY excitation spectrum is obtained by monitoring the emission of at 485 nm, and the excitation wavelength for the emission spectrum is 367 nm.