Supporting information

Fig. S1. SEM images of the MWCNT-Eu-Ionogel (A & B) and the MWCNT-Tb-Ionogel (C & D).

Calculation methods for the fluorescent quantum efficiency of MWCNT-Eu-Ionogel

The $^5D_0$ quantum efficiencies of all the europium complexes hybrid materials were estimated according to Juud-Ofelt theory. The detailed methods are listed below:

$$A_{0J} = A_{01} \times \frac{I_{0J}}{I_{01}} \times \frac{\nu_{01}}{\nu_{0J}}$$

$$A_r = \sum A_{0J} = A_{00} + A_{01} + A_{02} + A_{03} + A_{04}$$

$$\frac{1}{\tau} = A_r + A_{nr}$$

$$\eta = \frac{A_r}{A_r + A_{nr}}$$

$A_{01}$ is the Einstein’s coefficient of spontaneous emission between $^5D_0$ and $^7F_1$, the value of it is determined to be 50 s$^{-1}$ theoretically; $I_{0J}$ is the $^5D_0 \rightarrow ^7F_j$ ($j=0-4$) transition intensities calculated from the peaks; and the $\nu_{0j}$ ($j=0-4$) is the energy barycenter of the corresponding emission peaks; $A_r$ is the rate of radiative transition, and the $A_{nr}$ is the one of non-radiative. Finally, the luminescence quantum efficiencies of europium complexes hybrid materials can be seen as equal to the ratio of $A_r$ to value of $(A_r + A_{nr})$. 