Electronic Supplementary Information

Controllable hydrothermal synthesis of $Eu^{3+}/Tb^{3+}/Dy^{3+}$ activated $Zn_8[(BO_3)_3O_2(OH)_3]$ micro/nanostructured phosphors: energy transfer and tunable emissions

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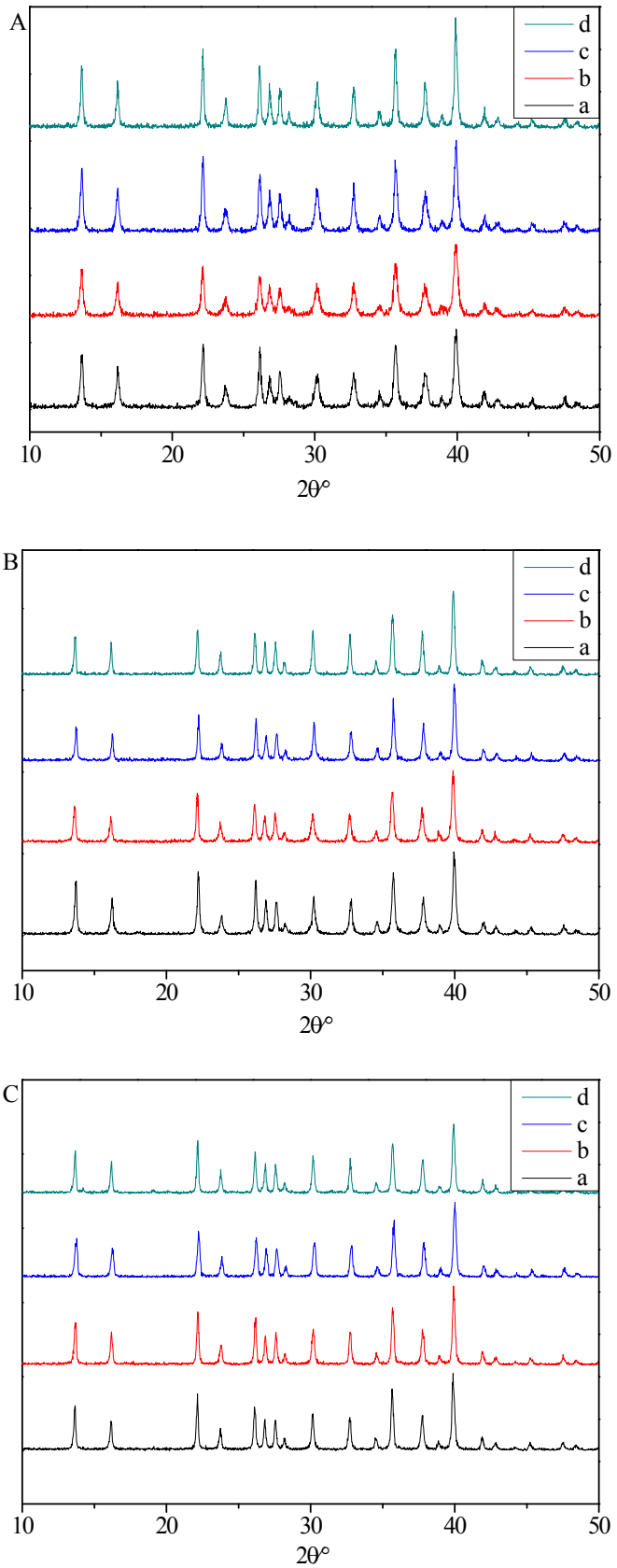

Fig. S1 XRD patterns at different doped concentrations of (A)ZBH:xDy^{3+}: ((a) x=0.01, (b)x=0.02, (c)x=0.03 and (d)x=0.04); (B)ZBH:xEu^{3+}/yTb^{3+} (x=0.05; y=0.005(a), 0.01(b), 0.015(c) and 0.02(d)); (C)ZBH:xTb^{3+}/yDy^{3+} (x=0.05; y=0.001(a), 0.005(b), 0.01(c) and 0.02(d))

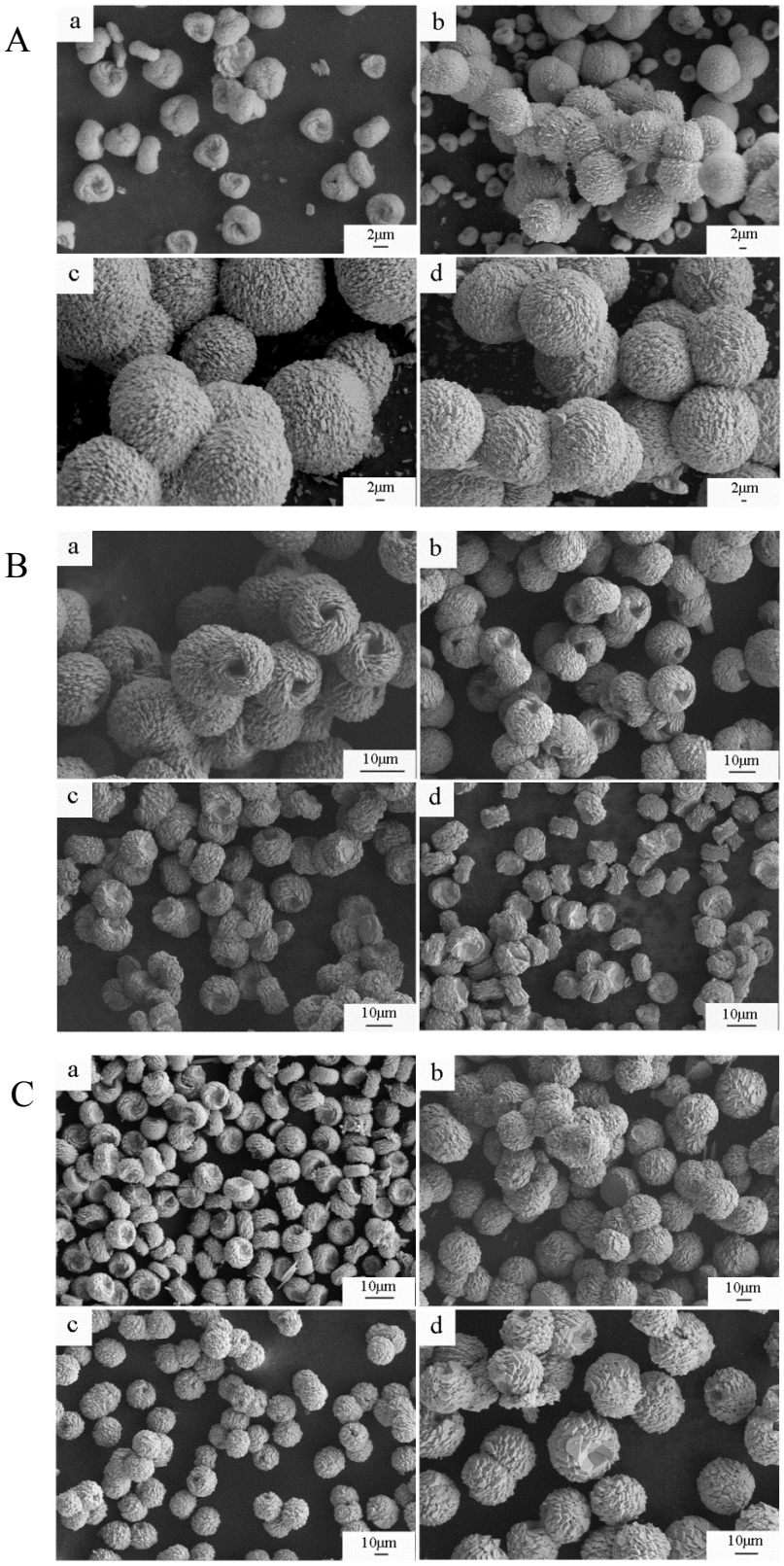

Fig. S2 SEM imagines at different doped concentrations of (A)ZBH:xDy^{3+}: ((a) x=0.01, (b)x=0.02, (c)x=0.03 and (d)x=0.04); (B)ZBH:xEu^{3+}/yTb^{3+} (x=0.05; y=0.005(a), 0.01(b), 0.015(c) and 0.02(d)); (C)ZBH:xTb^{3+}/yDy^{3+} (x=0.05; y=0.001(a), 0.005(b), 0.01(c) and 0.02(d))

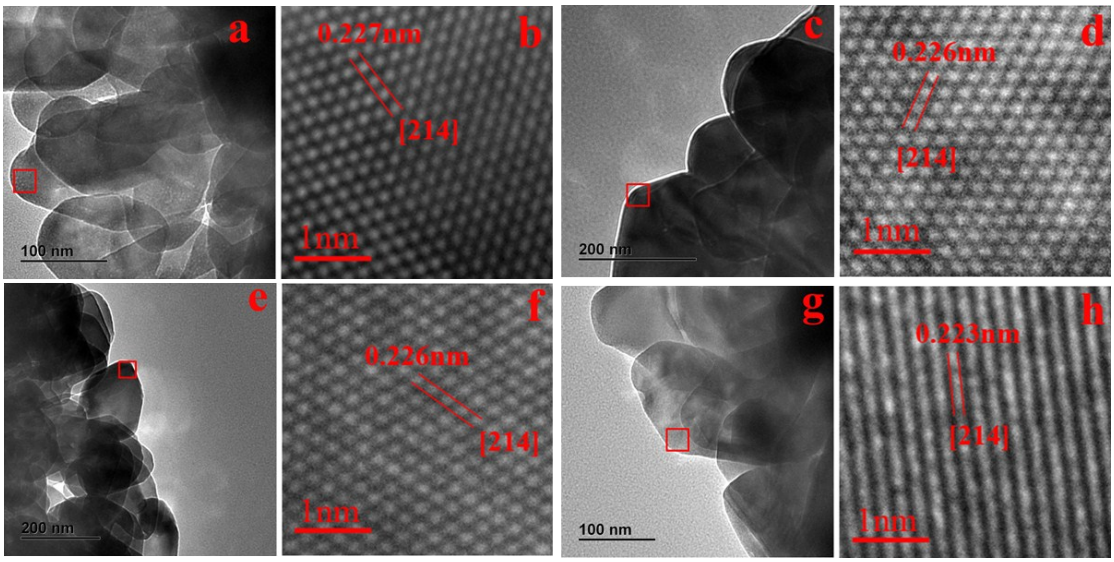

Fig. S3 The imagines of TEM and HRTEM of (a, b) ZBH:0.03Tb^{3+}, (c, d) ZBH:0.01Dy^{3+}, (e, f) ZBH:0.05Eu^{3+}/0.005Tb^{3+} and (g, h) ZBH:0.05Tb^{3+}/0.001Dy^{3+}

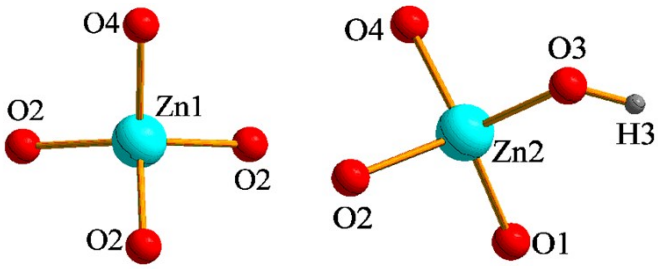

Fig. S4 The coordinated environment of two types of Zn^{2+} cations in $Zn_8[(BO_3)_3O_2(OH)_3]$

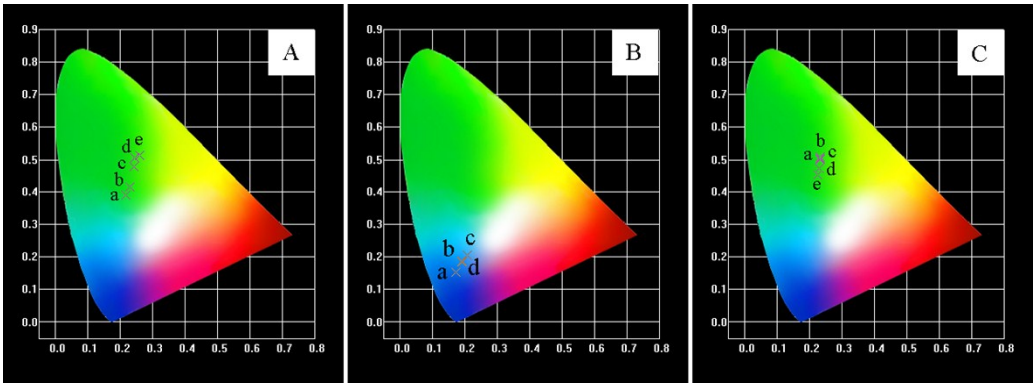

Fig. S5 (A) CIE diagram of ZBH:xTb^{3+} (x=0.01 (a), 0.03 (b), 0.05 (c), 0.07 (d) and 0.10(e)) excited at 236 nm, (B) ZBH:xDy^{3+} ((x=0.01 (a), 0.02 (b), 0.03 (c) and 0.04 (d))excited at 354 nm and (C) ZBH:xTb^{3+}/yDy^{3+} (x=0.05; y=0.001, 0.005, 0.01 and 0.02) excited at 233 nm, respectively.

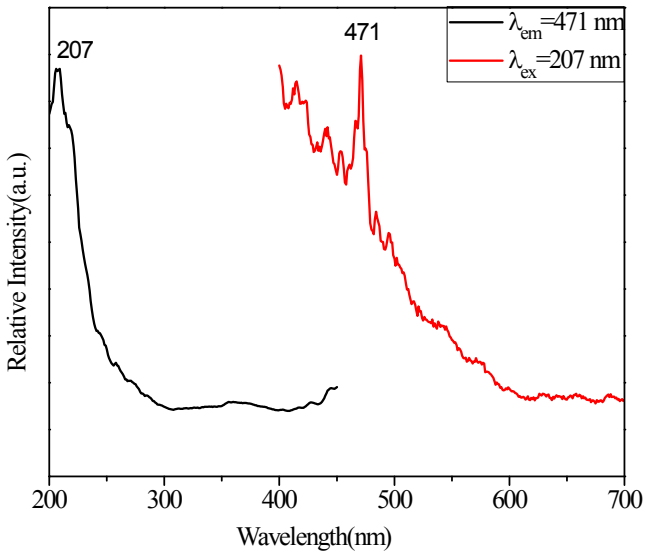

Fig. S6 PL excitation (left) and emission spectra (right) of undoped ZBH

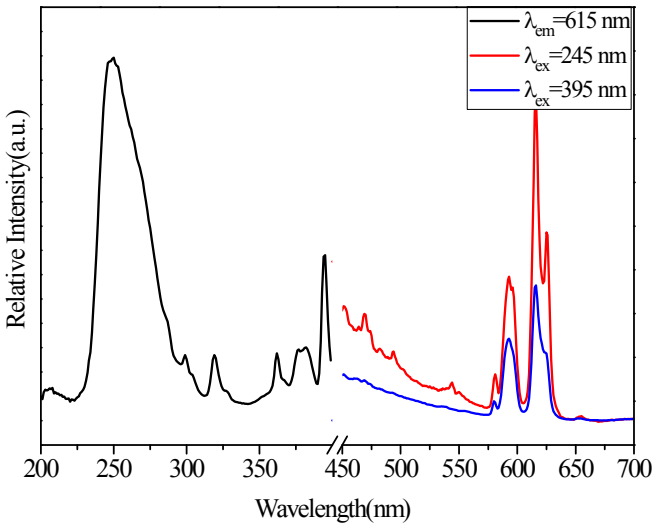

Fig. S7 PL excitation (left) spectrum under the emission of 615 nm and emission spectra (right) excited at 245 nm (red curve) and 395 nm (blue curve) of ZBH:0.05Eu^{3+}

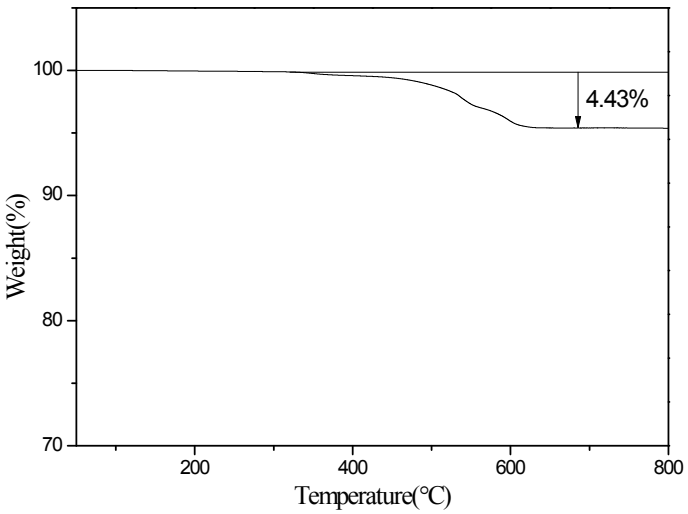

Fig. S8 Simultaneous TG-DTA curves of the ZBH product.