Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supplementary Information

Bifunctional AlN:Tb Semiconductor with Luminescence and Photocatalytic Properties

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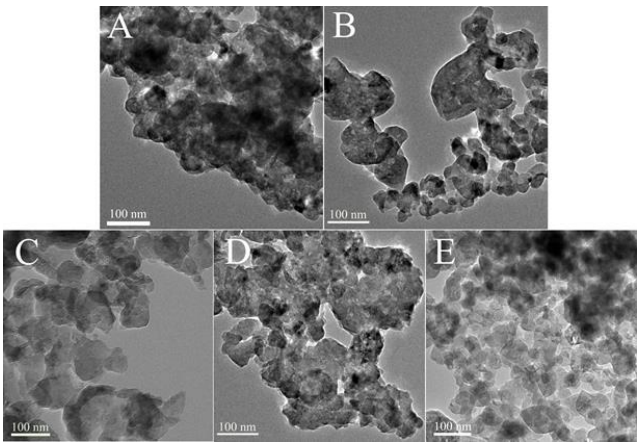

Fig. S1 TEM images of AlN samples doped with (A) 0.1%, (B) 0.3%, (C) 0.5%, (D) 0.8%, (E) 1% Tb.

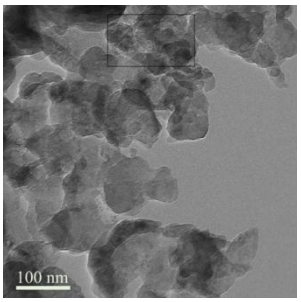

Fig. S2 HRTEM image of AlN:Tb nanoparticles

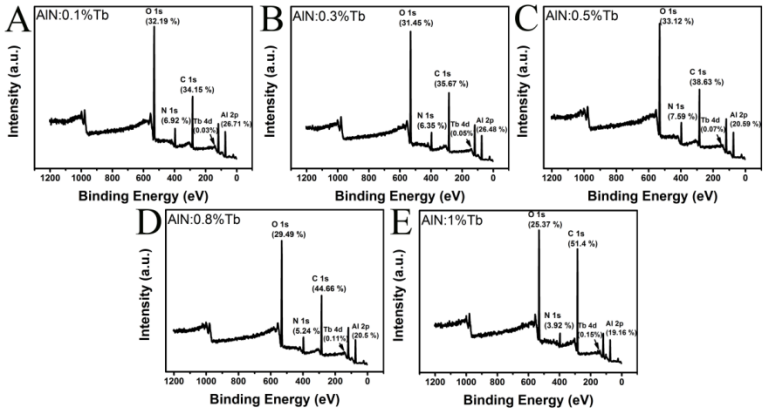

Fig. S3 Wide scan XPS spectra of AlN doped with Tb samples.

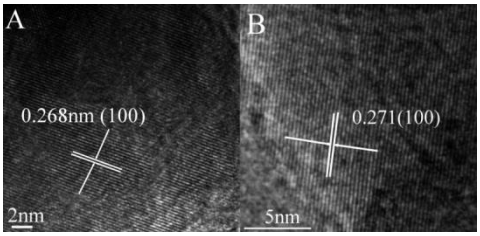

Fig. S4 HRTEM images of undoped AlN (A) and AlN:0.5%Tb (B).

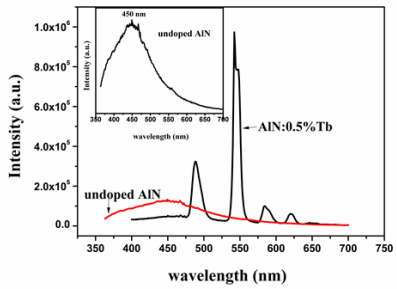

Fig. S5 PL emission spectra of undoped AlN and AlN:0.5%Tb samples. The inset shows the PL spectrum of undoped AlN sample.

As shown in Fig. S4, we compare the PL spectra of the undoped AlN and AlN:0.5%Tb sample. Only an emission band located at 450 nm can be seen in the PL spectrum of undoped AlN, which originates from the lattice defects in AlN matrix. Similar PL characteristics have been reported in undoped AlN (*J. AM. CHEM. SOC. 2005, 127, 1318-1322; J. Phys. Chem. C 2009, 113, 14245–14248; J. Phys. Chem. C 2007, 111, 12639-12642*). According to the previous researches, the PL emission induced by the lattice defects is usually broad band but not narrow lines. However, the PL spectrum of AlN:0.5%Tb shows the characteristic narrow line emissions of Tb ions. The sharp line emissions at 489, 542, 583, 623 nm correspond to the transitions from the excited $^5D_4$ state to the ^7F_J (J=6, 5, 4, 3) states of Tb^{3+}.Therefore, the green emission comes from the Tb doping rather than the lattice defects.

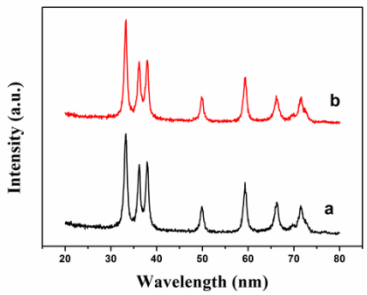

Fig. S6 XRD patterns of AlN:0.5%Tb sample (a) before and (b) after the photocatalytic H_2 evolution experiment.