

Electric Supplementary Information

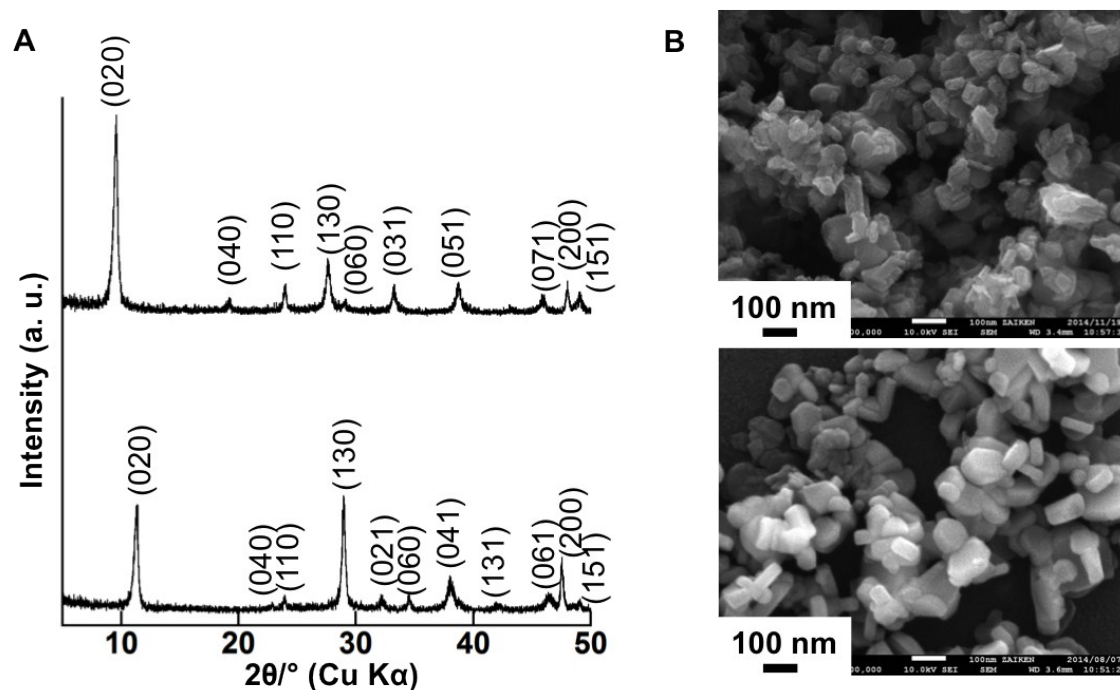


Fig. S1 (A) XRD patterns and (B) SEM images of (bottom) KTLO and (top) HTO.

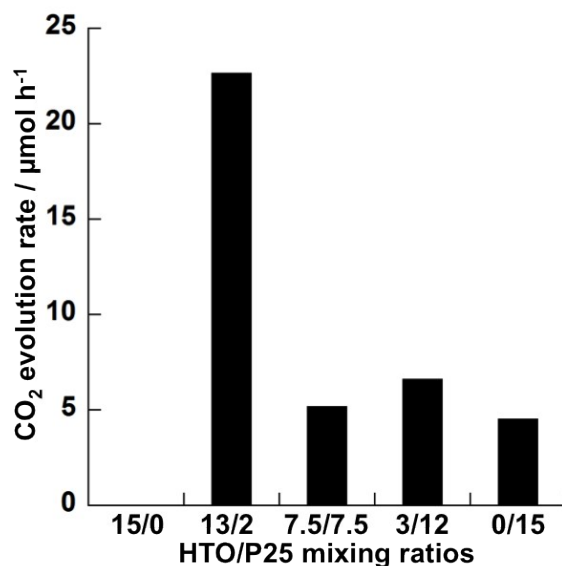


Fig. S2 CO₂ evolution rates at different HTO/P25 (mg/mg) mixing ratios under simulated solar light (>300 nm).

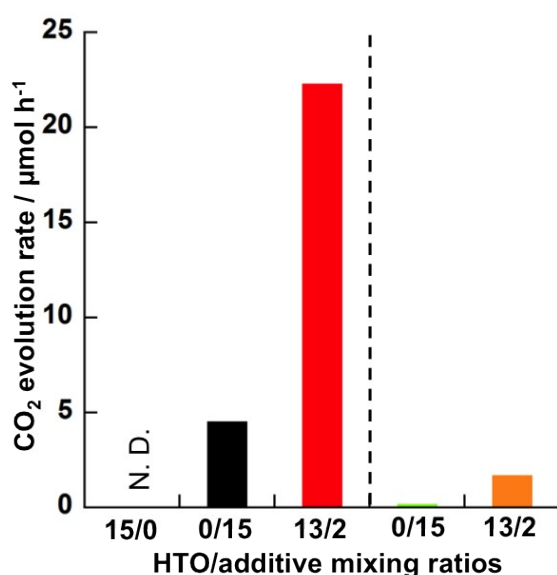


Fig. S3 CO₂ evolution rates at different (left) HTO/P25 (mg/mg) mixing ratios and (right) HTO/WO₃ (mg/mg) mixing ratios. To further confirm the electron transfer from HTO to P25 presented in the manuscript, we examined the photocatalytic activity of the HTO/WO₃ mixture, in which transfer of both photogenerated electrons and holes in HTO to WO₃ is possible judging from the electronic band structures of HTO and WO₃ (Fig. 1C). The HTO/WO₃ mixture showed much lower photocatalytic activity compared to the HTO/P25 composite. One possible reason for this result is that WO₃ scarcely form particle interface with HTO. Unlike P25 particles, WO₃ particles are hard to electrostatically interact with HTO particles under the identical condition (pH 4) because the isoelectric point of WO₃ (~ 2.5)¹ is similar to that of HTO. Another possible reason is poor O₂ reduction ability of WO₃. The conduction band potential of WO₃ is more positive than the potential for single-electron reduction of O₂,^{2,3} thus, electrons transferred from HTO to WO₃ cannot reduce the oxygen. On the other hand, if the driving force of the high photocatalytic activity of HTO/P25 composite was

the hole transfer between them, high photocatalytic activity should also be observed for the HTO/WO₃ mixture.

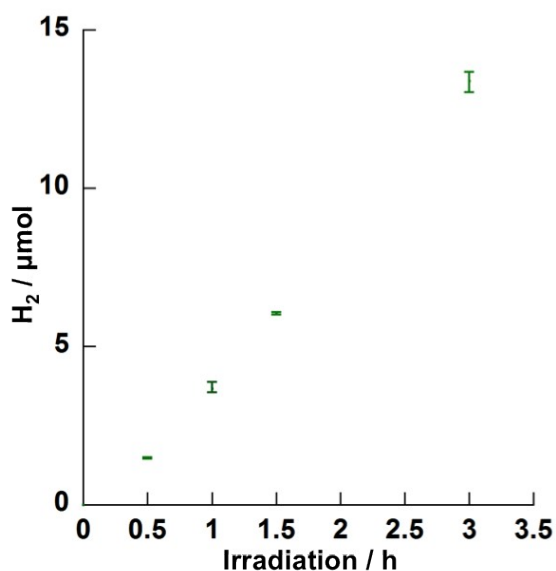


Fig. S4 The time course of H₂ evolution from aqueous methanol solution of HTO/Pt@P25 composite (13 mg/2 mg) under monochromated light irradiation (320 nm).

References

- 1 M. Anik and T. Cansizoglu, *J. Appl. Electrochem.*, 2006, **36**, 603-608.
- 2 A. Fujishima, X. Zhang and D. A. Tryk, *Surf. Sci. Rep.*, 2008, **63**, 515-582.
- 3 R. Abe, H. Takami, N. Murakami and B. Ohtani, *J. Am. Chem. Soc.*, 2008, **130**, 7780-7781.