Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplementary Information

Unusual photocatalytic materials with UV-VIS-NIR spectral response: deciphering the photothermocatalytic synergetic effect of $Pt/LaVO_4/TiO_2$

Jialin Fang, Danzhen Li*, Yu Shao, Junhua Hu

State Key Laboratory of Photocatalysis on Energy and Environment, Research Institute of Photocatalysis, Fuzhou University, Fuzhou 350002, P. R. China

Corresponding author Tel & Fax: (+86)591-83779256, E-mail: dzli@fzu.edu.cn.

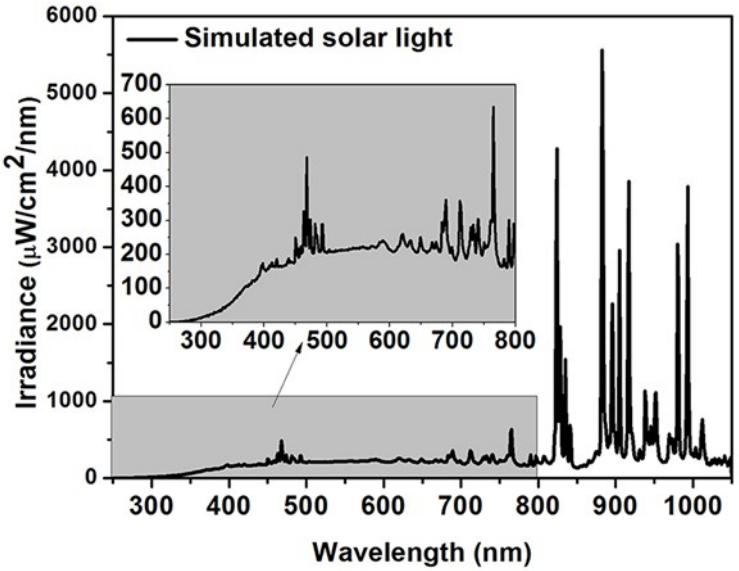

Figure S1 The spectra of irradiance for 500 W Xe-arc lamp as simulated solar light source for the experiment of catalytic activity, inserting the magnified graph within 250<λ<800 nm.

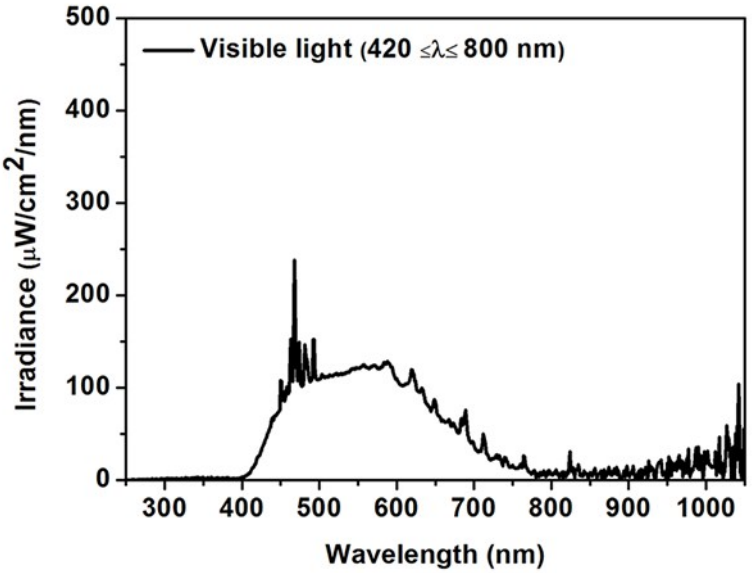

Figure S2 The spectra of irradiance of 500 W Xe-arc lampequipped with 420<λ<800 nm filter as visible light source.

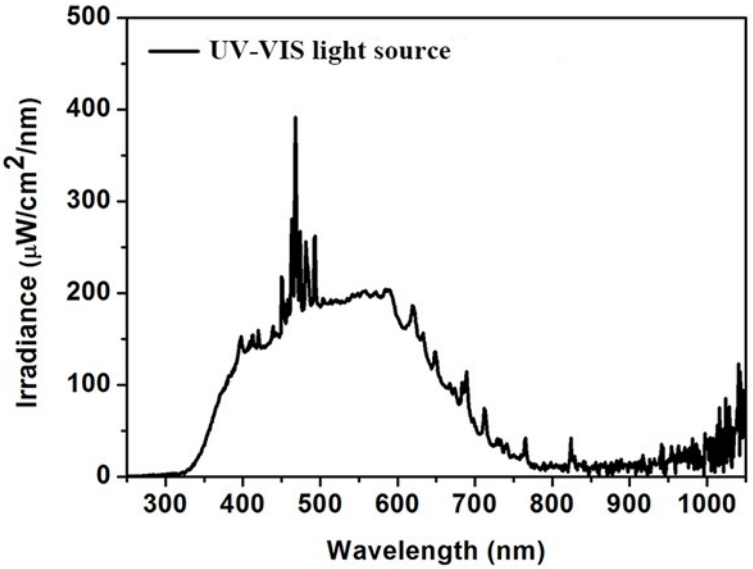

Figure S3 The spectra of irradiation of 500 W Xe-arc lamp equipped with a 300<λ<800 nm filter as the UV-VIS light source for the photocatalytic experiment of ESR and O_2-TPD.

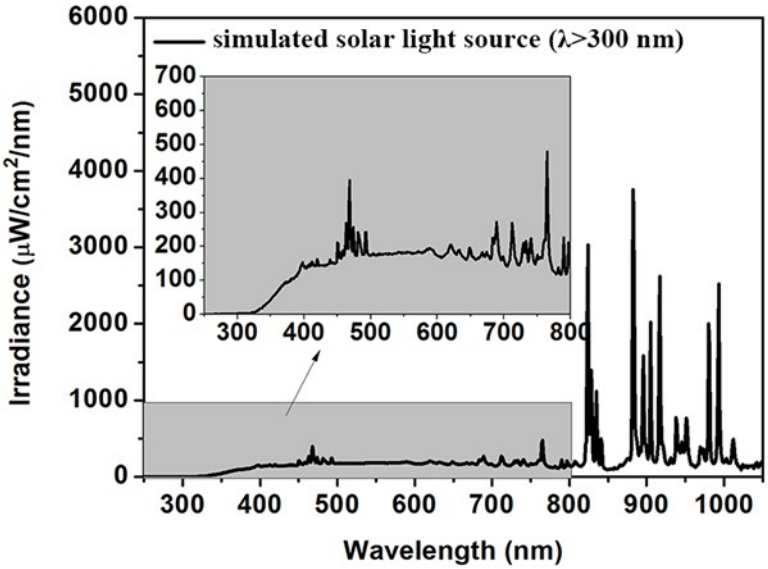

Figure S4 The spectra of irradiation of 500 W Xe-arc lampe quipped with a λ>300 nm filter as simulated solar light source for the photothermocatalytic experiment of ESR and O_2-TPD, inserting the magnified graph within 250<λ<800 nm.

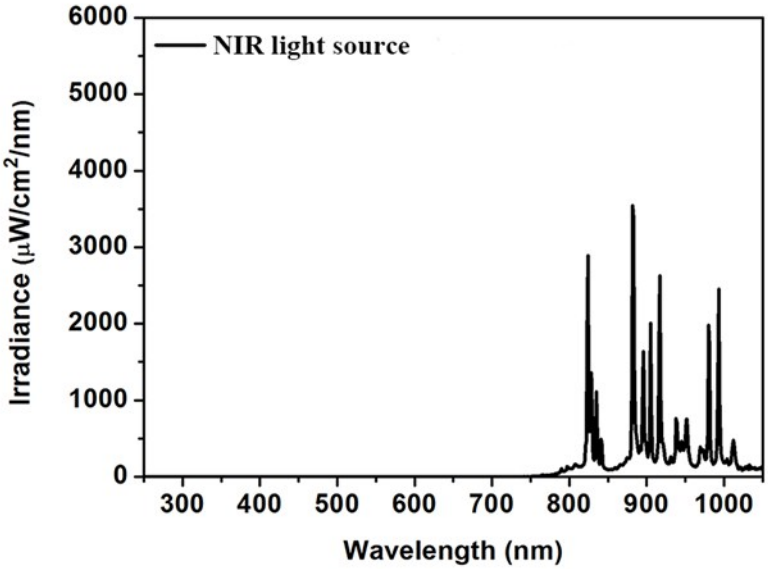

Figure S5 The spectra of irradiation of 500 W Xe-arc lamp equipped with a λ>800 nm filter as the NIR light source for the thermocatalytic experiment of ESR.

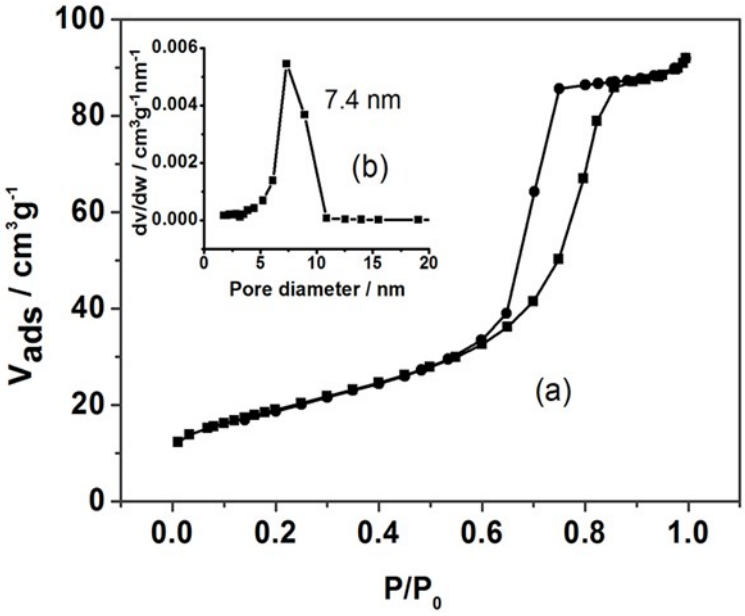

Figure S6 Nitrogen-sorption isotherms (a) and the pore size distribution plot (b) of PLVT.

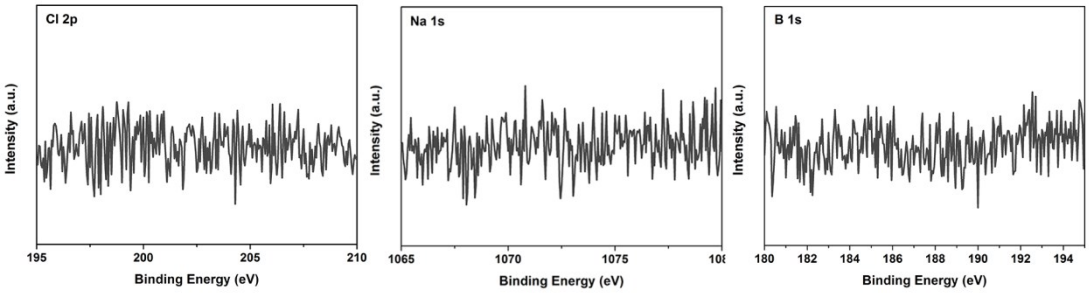

Figure S7 XPS spectra for Cl Na and B of PLVT.

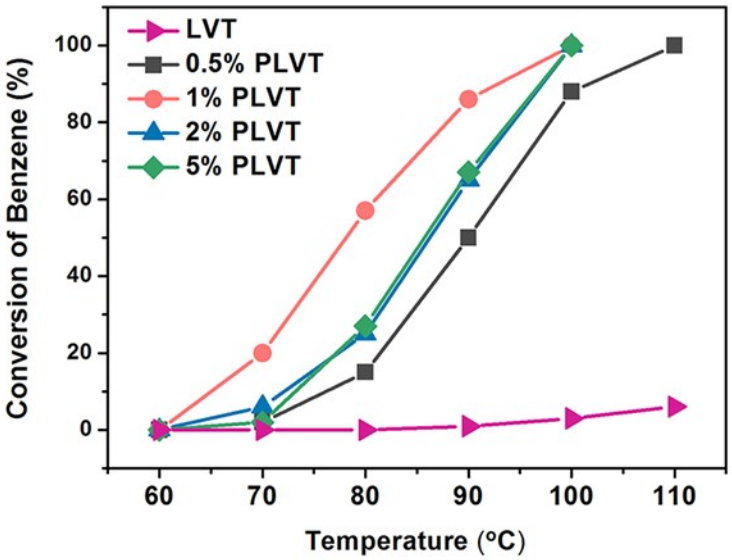

Figure S8 The thermocatalytic conversion of benzene over LVT and PLVT with different loading amount of Pt.

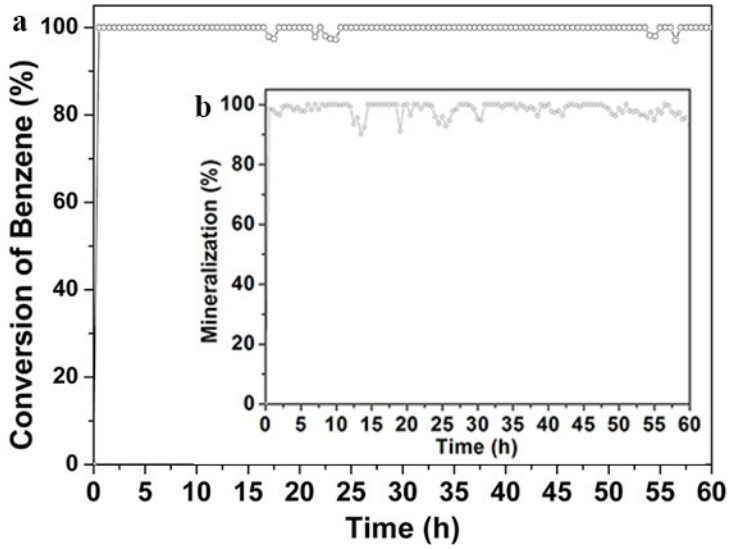

Figure S9 (a) Durable conversion of benzene and **(b)** mineralization over PLVT at the irradiation of simulated solar light without extra heating source and cutoff filter.

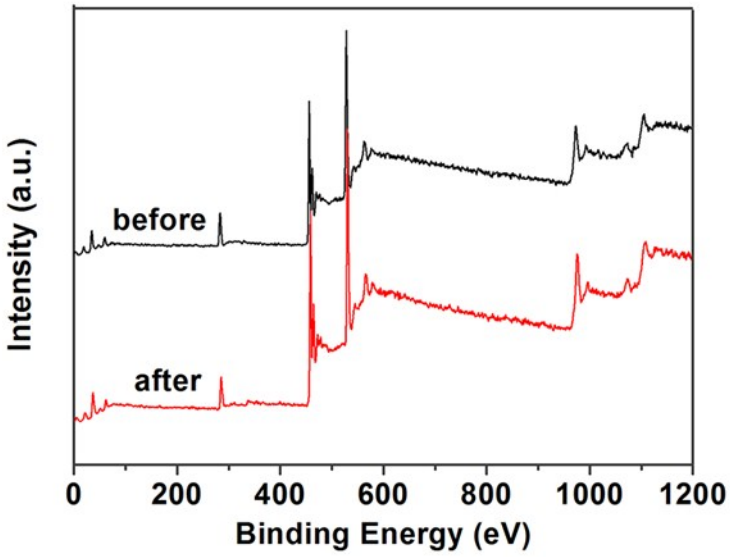

Figure S10 XPS survey spectra of PLVT before and after catalytic reaction

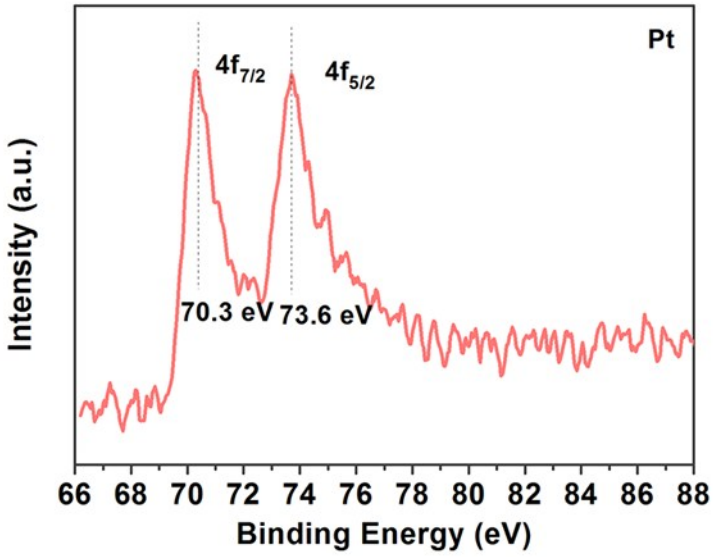

Figure S11 XPS survey spectra of Pt in Pt/TiO_2

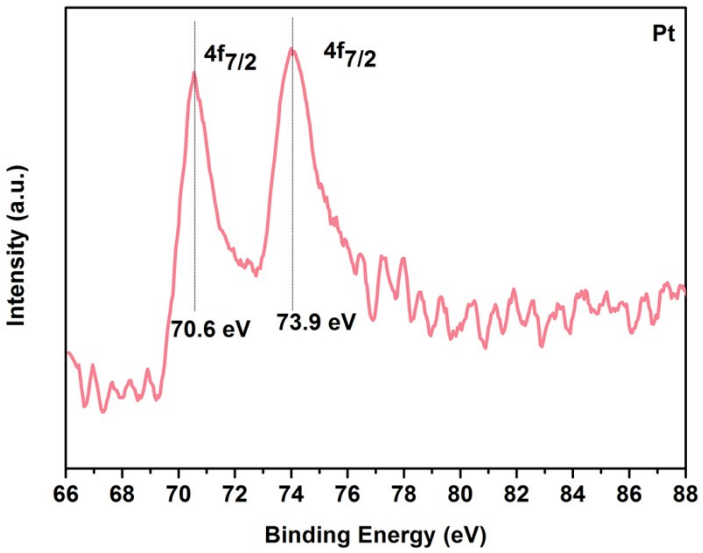

Figure S12 XPS survey spectra of Pt in Pt/$LaVO_4$.

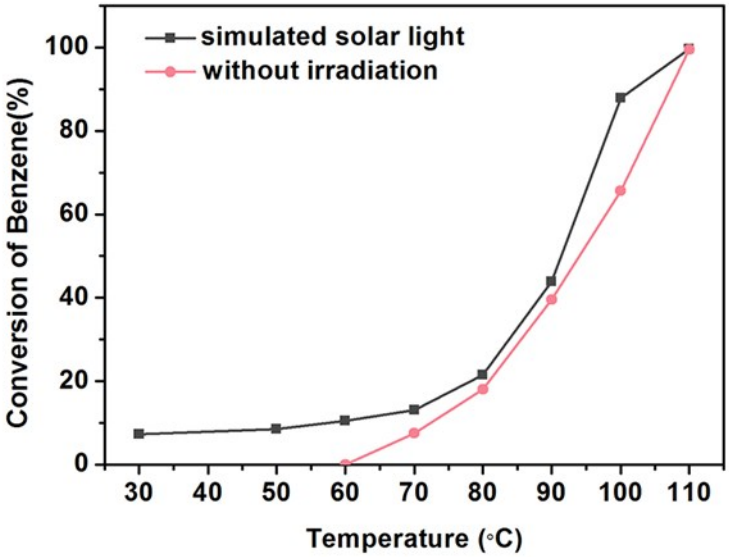

Figure S13 Conversion of benzene versus temperature over Pt/TiO_2 under simulated solar light and without irradiation for the thermocatalysis.

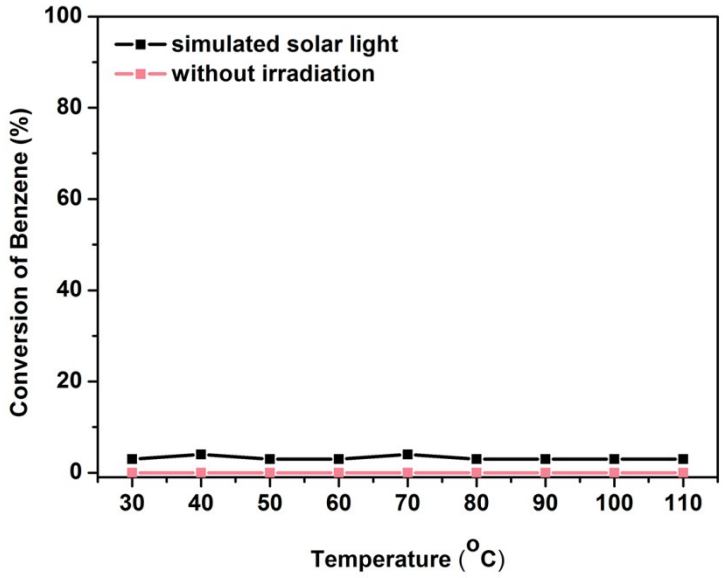

Figure S14 Conversion of benzene versus temperature over Pt/$LaVO_4$ under simulated solar light and without irradiation for the thermocatalysis.

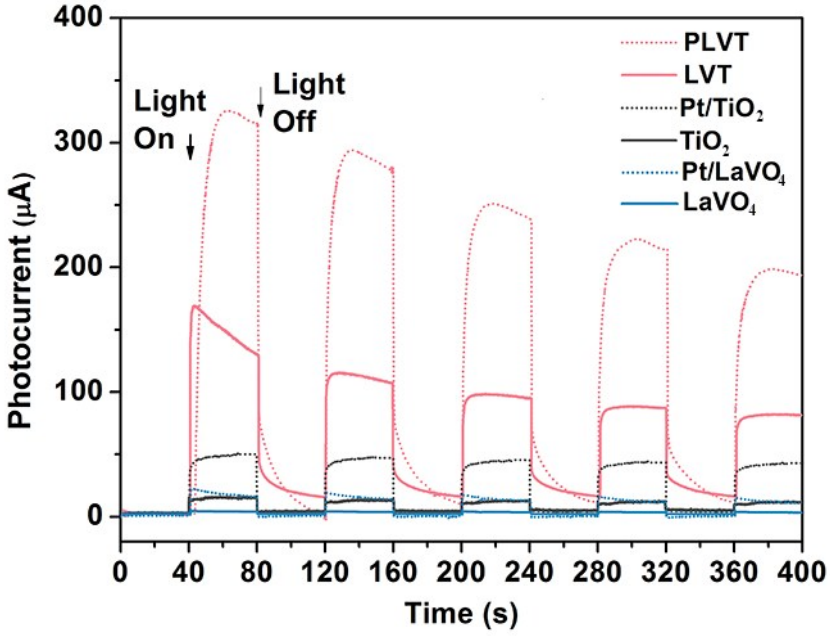

Figure S15 Photocurrent of TiO_2, Pt/TiO_2, $LaVO_4$, $Pt/LaVO_4$, LVT and PLVT under irradiation of 500 W Xe-arc lamp equipped with a $300<\lambda<800$ nm filter (see the irradiation graph in Figure S3).

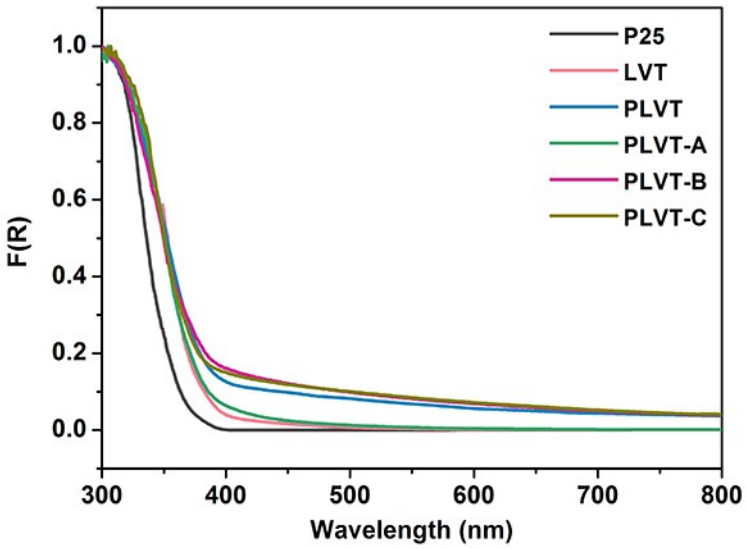

Figure S16 UV-vis DRS of P25, LVT, PLVT, PLVT-A, B and C.

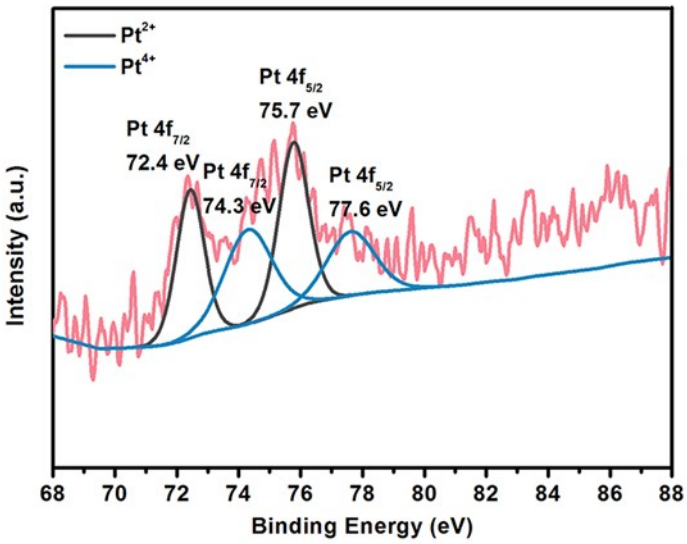

Figure S17 XPS survey spectra of Pt in PLVT-A, in which peaks at 72.4 and 75.7 eV belong to Pt^{2+} and peaks at 74.3 and 77.6 eV belong to Pt^{4+}.

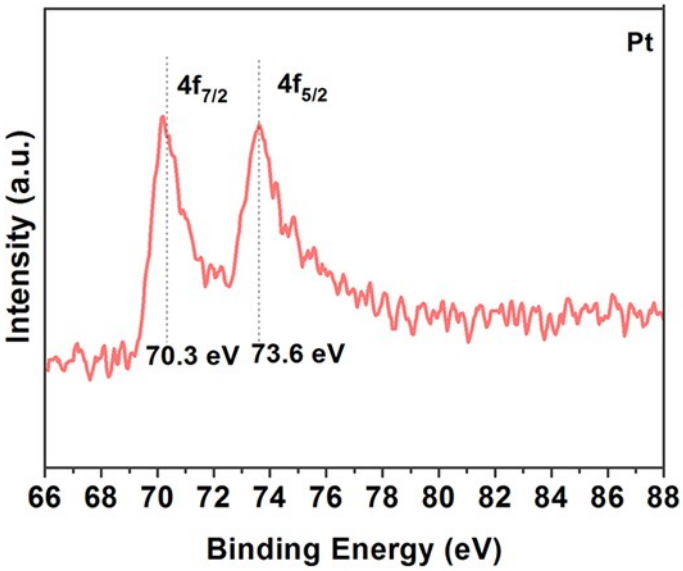

Figure S18 XPS survey spectra of Pt in PLVT-B

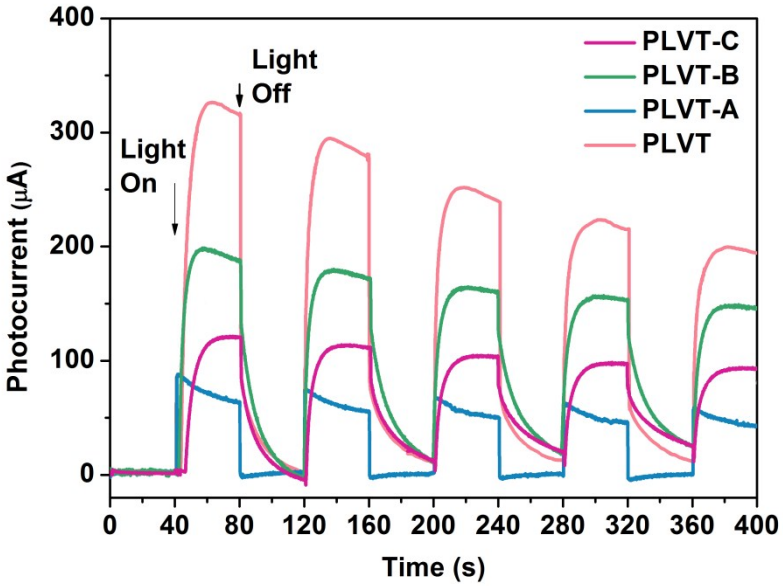

Figure S19 Photocurrent of PLVT, PLVT-A, PLVT-B and PLVT-C under irradiation of 500 W Xe-arc lamp equipped with a 300<λ<800 nm filter (see the irradiation graph in Figure S3).

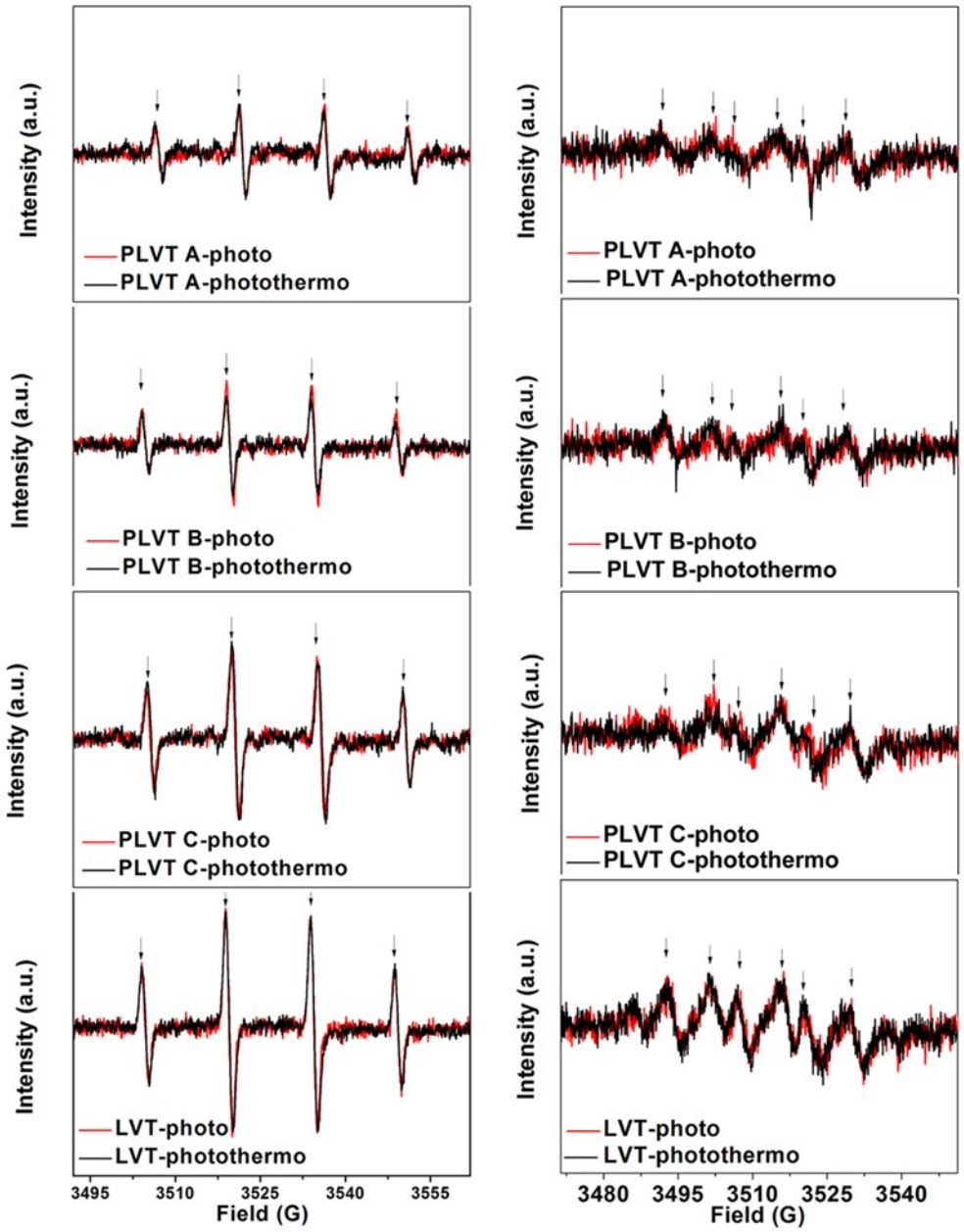

Figure S20 ESR signals of DMPO-·OH and $O_2^{\cdot-}$ of LVT, PLVT-A, B, and C under UV-VIS light (denoted as PLVT-photo, see the irradiation graph in Figure S3) and simulated solar light (denoted as PLVT-photothermo, see the irradiation graph in Figure S4)

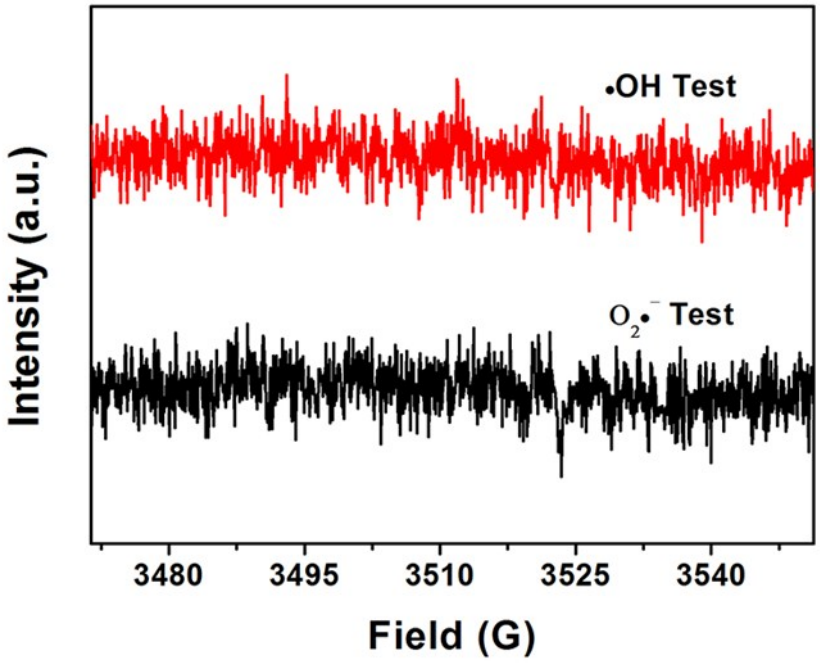

Figure S21 ESR signals of DMPO-·OH and O_2·⁻ of PLVT under NIR (see the irradiation graph in Figure S5)

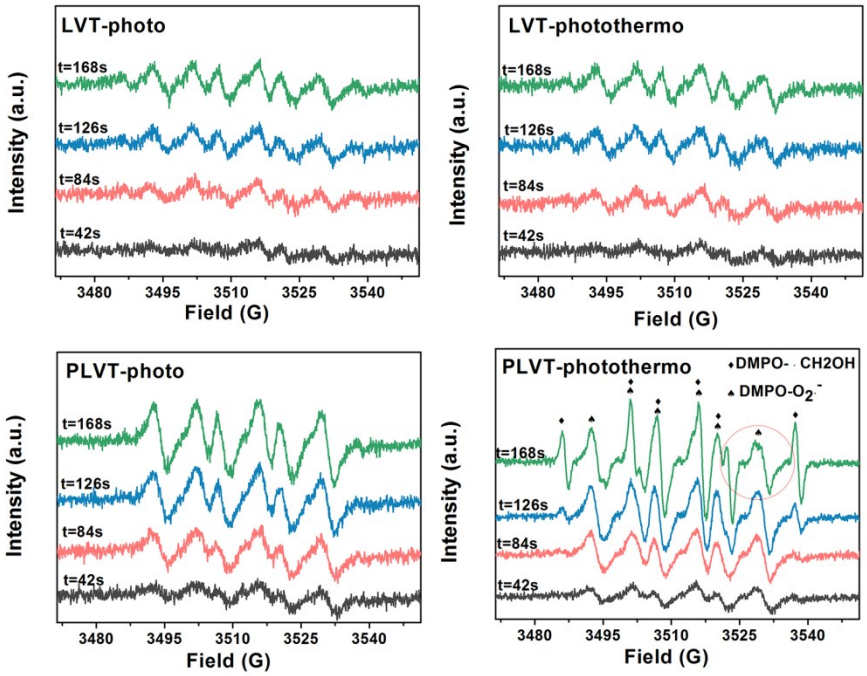

Figure S22 ESR signals of DMPO-$O_2^{\cdot -}$ adduct of LVT and PLVT under UV-VIS light (denoted as PLVT-photo, see the irradiation graph in Figure S3) and simulated solar light (denoted as PLVT-photothermo, see the irradiation graph in Figure S4) with irradiation time

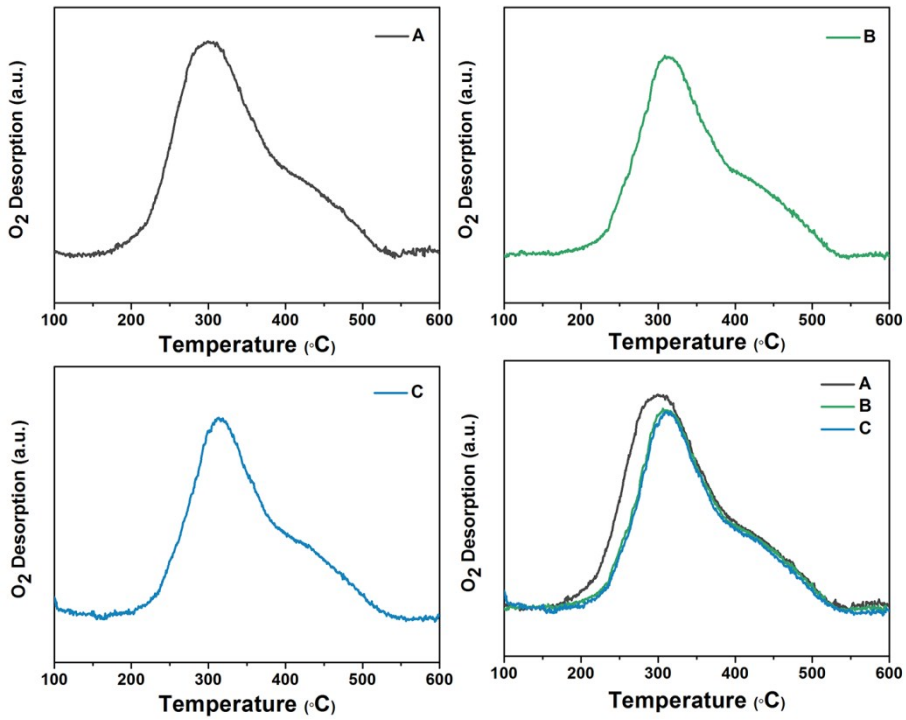

Figure S23 O_2-TPD profile of Pt/TiO_2 with the process of oxygen adsorption under (a) 70 °C, (b) UV-vis irradiation (irradiation spectra in Figure S3) at ambient temperature, (c) simulated solar irradiation (irradiation spectra in Figure S4) at 70 °C and (d) the merge image of (a), (b) and (c)