Supporting Information

Light-driven Efficient Dry Reforming of Methane over Pt/La_2O_3 with Long-Time Durability

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1. Preparation

PVP-stabilized Pt nanoparticles (NPs) was obtained by the method in the literature.[1] The mixed solution of H_2PtCl_6, PVP and methanol was refluxed in a water bath, rotary evaporation, acetone precipitation, centrifugation and methanol constant volume to obtain the desired Pt NPs solution.

2. Characterizations

The actual contents of Pt were detected by inductively coupled plasma-optical emission spectroscopy (ICP-OES). X-ray diffraction (XRD) patterns with scanning angle (2θ) from 5° to 90°were collected on a PANalytical X' Pert Pro diffractometer using Cu Kα radiation. High resolution transmission electronic microscopy (HRTEM) images were taken by 3200F transmission electronic microscopy. Energy dispersive X-ray spectrometer (EDS) was used to visualize the elemental distribution by elemental mapping. Carbon deposition was surveyed by thermogravimetric (TG) analysis with a Netzsch TG 209 F3, which was firstly heated to 900 ^oC and maintain 30 min under N_2, then cooled to room temperature, and finally heated to 900 ^oC at a ramp rate of 10 ^oC/min in air. X-ray photoelectron spectroscopy (XPS) was used to determine the binding energies (B.E.) using the Thermo Scientific ESCALAB 250 instrument. The electron paramagnetic resonance (EPR) spectra under irradiation of full-spectrum light or in the dark were collected using an A300 spectrometer at -196 ^oC. Diffuse reflection absorption spectra (DRS) of the samples were recorded by a Shimadzu UV-3600 spectrophotometer equipped with an integrating sphere accessory in the diffuse reflectance mode (R) and $BaSO_4$ as a reference compound.

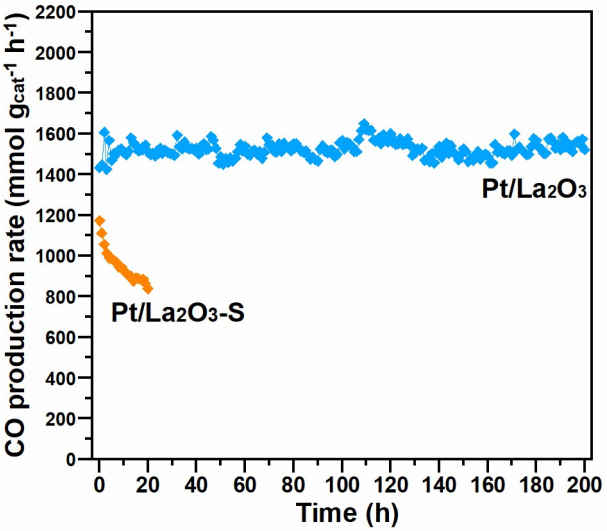

Fig. S1 The generation rate of CO on Pt/La_2O_3 and Pt/La_2O_3-S during long-time reaction.

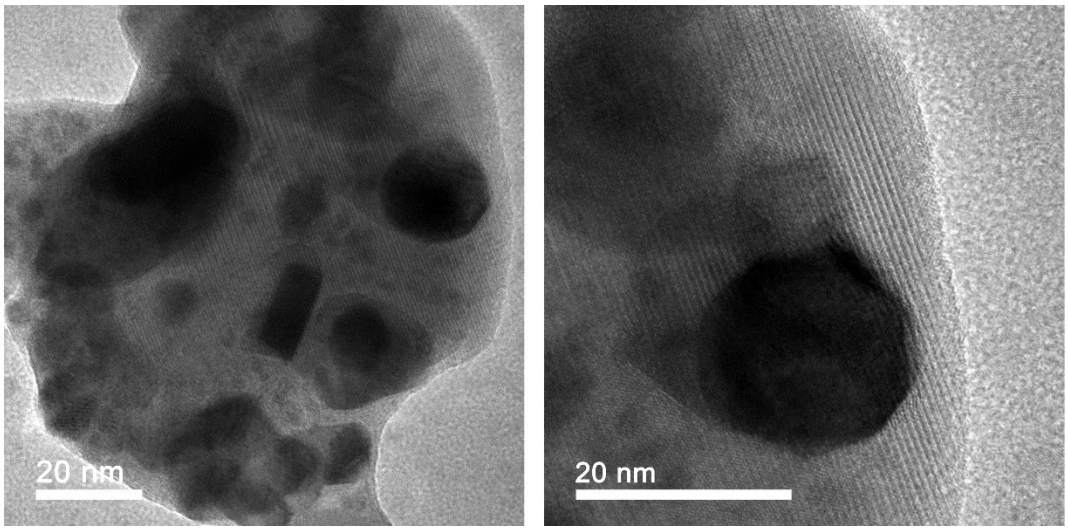

Fig. S2 HRTEM images of Pt/La_2O_3-S-U.

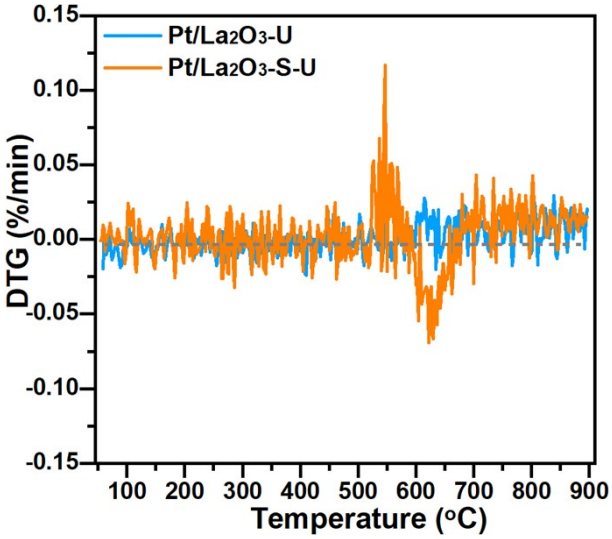

Fig. S3 TG analysis about DTG.

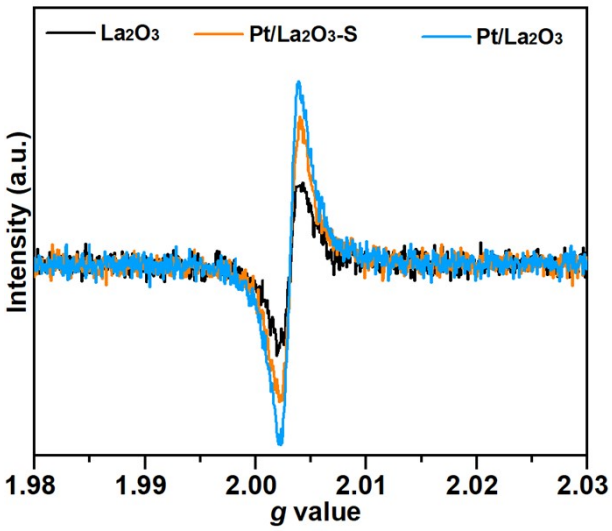

Fig. S4 EPR spectra of La_2O_3, Pt/La_2O_3 and Pt/La_2O_3-S under light irradiation.

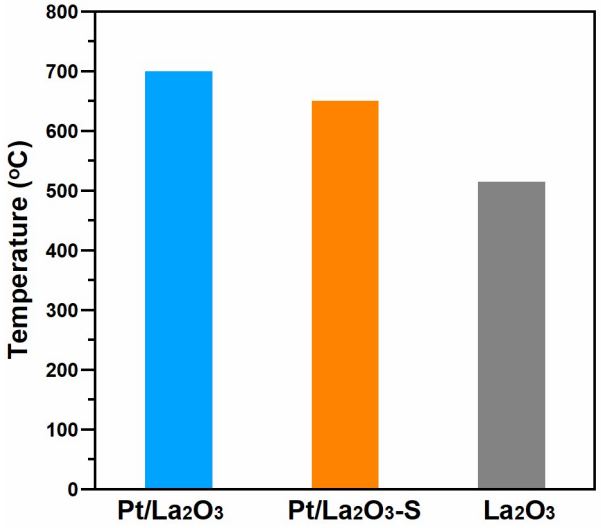

Fig. S5 The surface temperature value of samples.

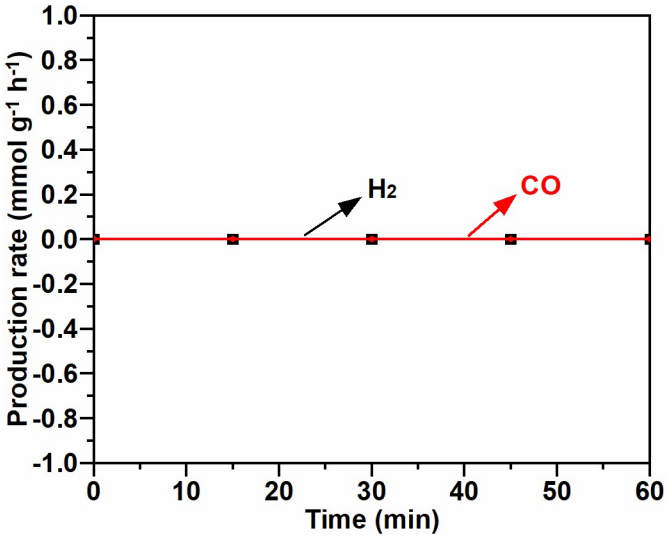

Fig. S6 The photocatalytic DRM on Pt/La_2O_3 for 60 minutes at 86 °C.

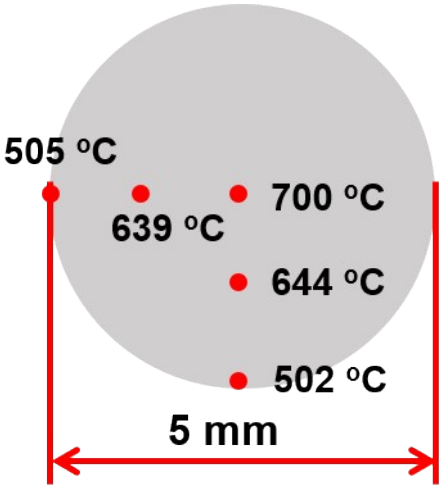

Fig. S7 The distribution of surface temperature on Pt/La_2O_3 under irradiation.

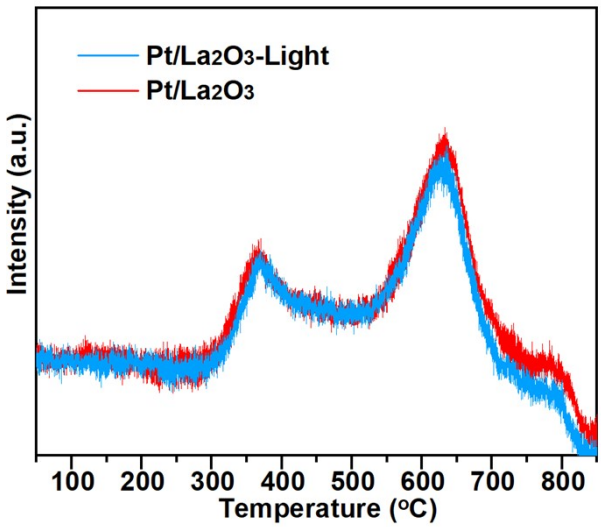

Fig. S8 CO desorption for CO-TPD on Pt/La_2O_3 under irradiation and in dark.

Table S1. Actual Pt content and XPS results of Pt and O.

Catalyst	Pt loading (wt.%)	Pt		O_I/O_{II}
		Pt^0	Pt^{2+}	
Pt/La_2O_3	4.84	0.62	0.38	0.19
Pt/La_2O_3-U	-	0.63	0.37	0.21
Pt/La_2O_3-S	4.24	0.38	0.62	0.15
Pt/La_2O_3-S-U	-	0.64	0.36	0.24

Reference

1 Lu, G.; Li, S. Z.; Guo, Z.; Farha, O. K.; Hauser, B. G.; Qi, X. Y.; Wang, Y.; Wang, X.; Han, S. Y.; Liu, X. G.; DuChene, J. S.; Zhang, H.; Zhang, Q. C.; Chen, X. D.; Ma, J.; Loo, S. C. J.; Wei, W. D.; Yang, Y. H.; Hupp, J. T.; Huo, F. W. *Nat. Chem.* **2012,** *4*, 310-316.