Supplementary Information:

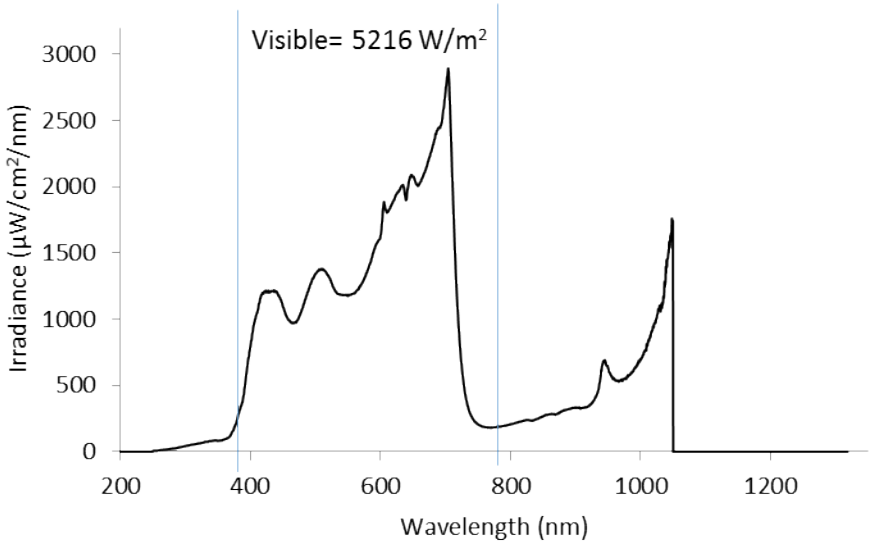

Figure S1. Spectral distribution of the light source used for plasmon enhanced reduction of CO_2 through reverse water gas shift reaction

Table S1. Criteria for showing absence of mass and heat transfer limitations in plasmon-enhanced RWGS reaction over Au/TiO_2 (DP) catalyst

	Criterion	Computed value	Controlling Regime	Ref.
Interphase heat	$\frac{\lvert\Delta H\rvert r''' r_p^2}{hT_b} < 0.15\frac{RT_b}{E}$	1.5×10^{-8}	$>1.3\times10^{-2}$	Ref[1]
Interparticle heat	$\frac{\lvert\Delta H\rvert r''' r_p^2}{k_e T_w} < 0.4\frac{RT_w/E}{\left[1+8(\frac{r_p}{R_o})Bi_w\right]}$	1.3×10^{-8}	$>3.0\times10^{-2}$	Ref[1]
Intraparticle heat	$\frac{\lvert\Delta H\rvert r''' r_p^2}{hT_s} < \frac{0.75RT_s}{E}$	1.3×10^{-8}	$>6.3\times10^{-2}$	Ref[2]
Intraparticle mass	$\frac{r''' r_p^2}{C_s D_e} < 0.3$	5.2×10^{-6}	$>3.0\times10^{-1}$	Ref[3]
Interphase mass	$\frac{r''' r_p^2}{C_s k_c} < \frac{0.15}{n}$	3.4×10^{-10}	$>3.0\times10^{-1}$	Ref[4]

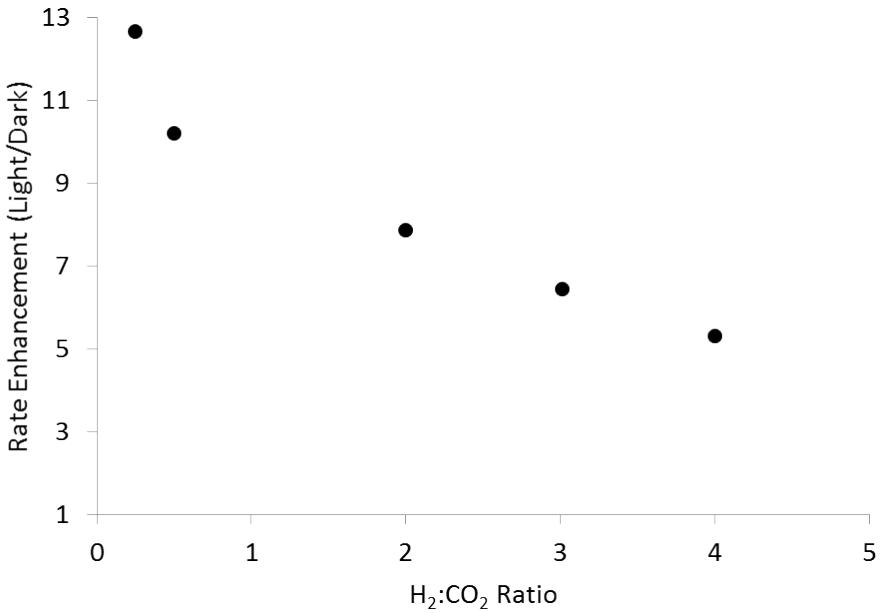

Figure S2. Dependence of rate enhancement (ratio of light to dark reaction rates) on H_2:CO_2 ratio in plasmon enhanced reverse water gas shift reaction over Au/TiO_2 catalyst. Experimental conditions: P= 103 psia, T=200 °C, Total gas flow rate= 15 sccm, catalyst amount= 7.9 mg.

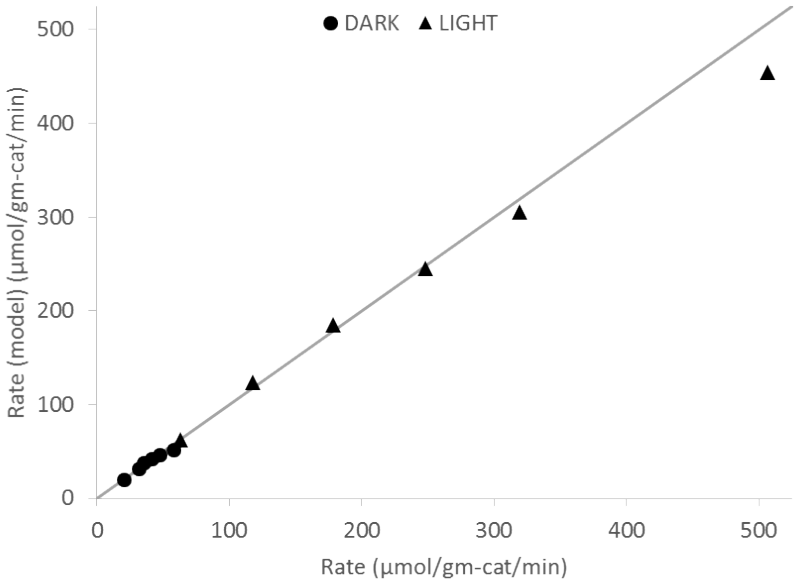

Figure S3. Model results against the experimental values for fitting the experimental data of rate dependence of RWGS reaction on CO_2 partial pressure with Equation 9

Nomenclature

ΔH: Heat of reaction
Bi_w: Biot number at the wall
C_s: Concentration of reactant at the external surface of the catalyst particle
D_e: Effective diffusivity
E: Activation energy of the reaction

h: Heat transfer coefficient
K_c: Mass-transfer coefficient between the catalyst and bulk phases
n: Reaction order
r''': Reaction rate per catalyst volume
R: Universal gas constant
R_o: Outer radius of reactor
r_p: Catalyst particle radius
T_b: Temperature of bulk phase
T_s: Catalyst surface temperature
T_w: Reactor wall temperature

References:

1. D. E. Mears, *J. Catal.*, 1971, 20, 127-131.
2. J. B. Anderson, *Aiche J.*, 1962, 18, 147-148.
3. P. B. Weisz and C. D. Prater, in *Advances in Catalysis*, eds. V. I. K. W.G. Frankenburg and E. K. Rideal, Academic Press, 1954, vol. Volume 6, pp. 143-196.
4. D. E. Mears, *Industrial & Engineering Chemistry Process Design and Development*, 1971, 10, 541-547.