Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Photothermal synergy for efficient dry reforming of CH_4 by Ag/AgBr/$CsPbBr_3$ composite

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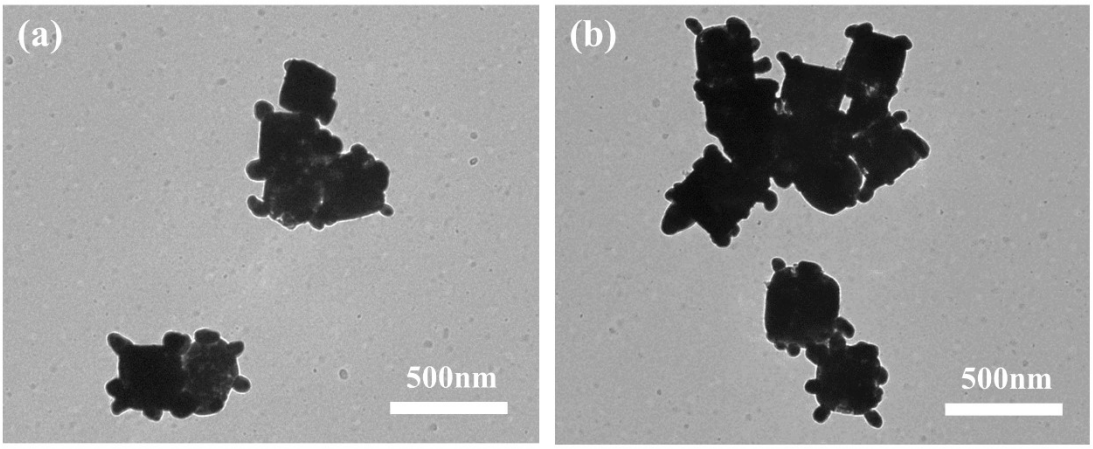

Fig. S1. TEM images (a, b) of Ag/AgCl.

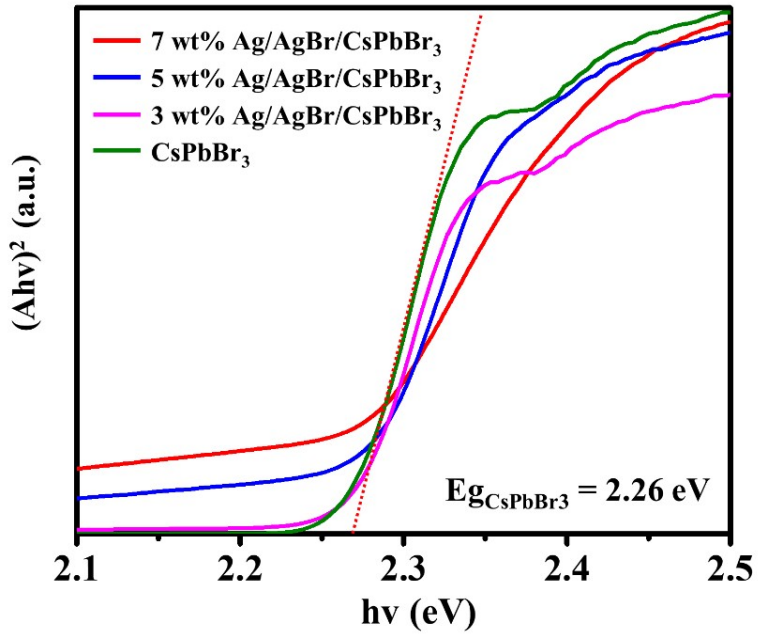

Fig. S2. The bandgap of pristine $CsPbBr_3$ and Ag/AgBr/$CsPbBr_3$ composites.

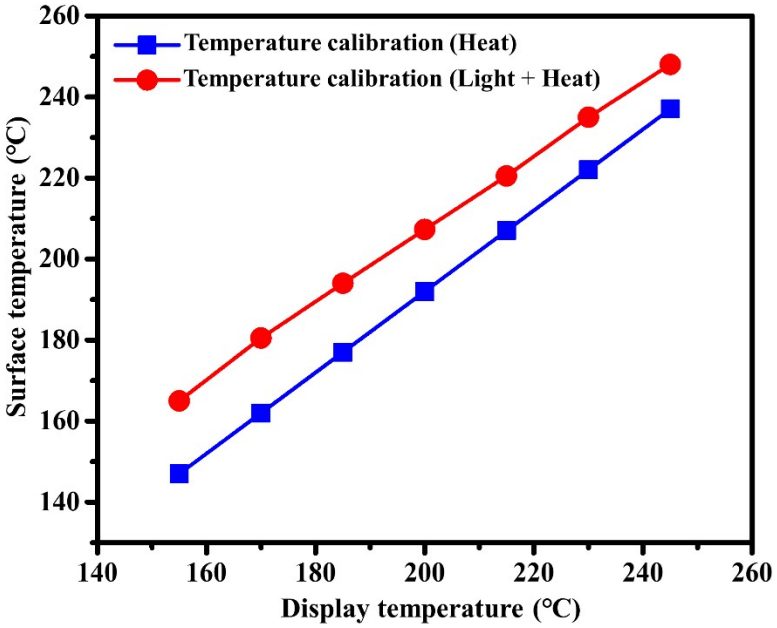

Fig. S3. Calibration of Ag/AgBr/$CsPbBr_3$ surface temperature under light + heat and heat conditions.

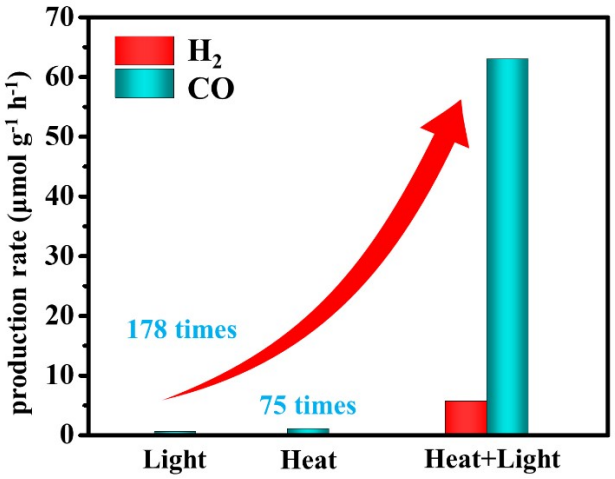

Fig. S4. The catalytic activities of the $CsPbBr_3$ with photocatalysis, thermal catalysis (200 °C) and photothermal catalysis (200 °C).

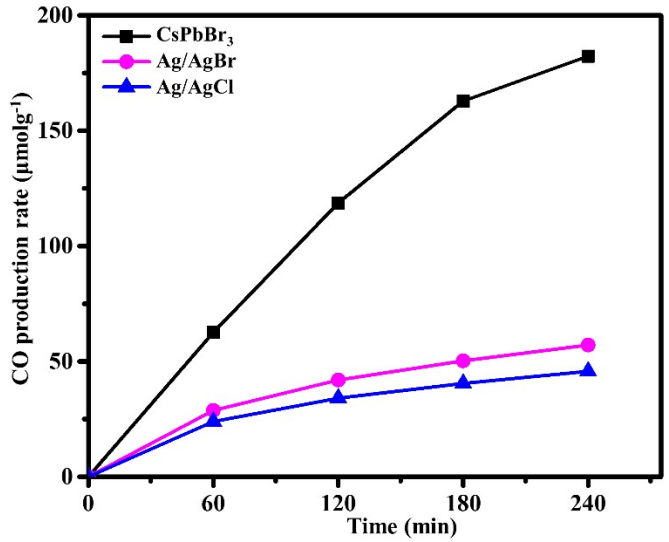

Fig. S5. CO production rates over Ag/AgCl, Ag/AgBr and $CsPbBr_3$ with photothermal catalysis (200 ℃).

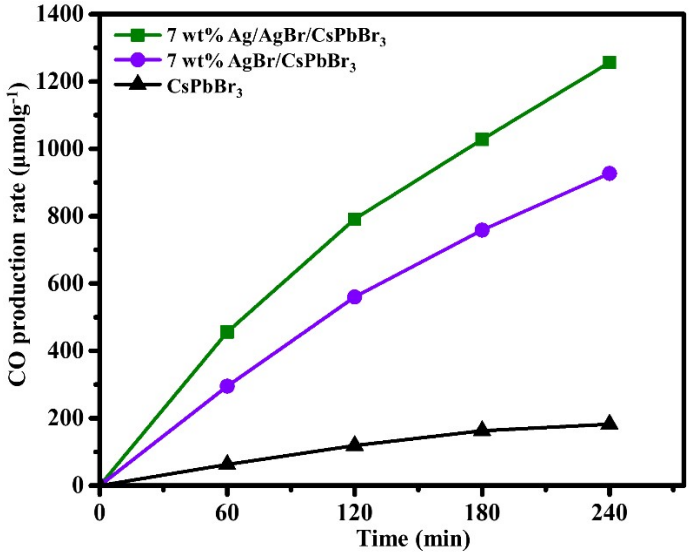

Fig. S6. CO production rates over 7 wt% $Ag/AgBr/CsPbBr_3$, 7 wt% $AgBr/CsPbBr_3$ and $CsPbBr_3$ with photothermal catalysis (200 ℃).

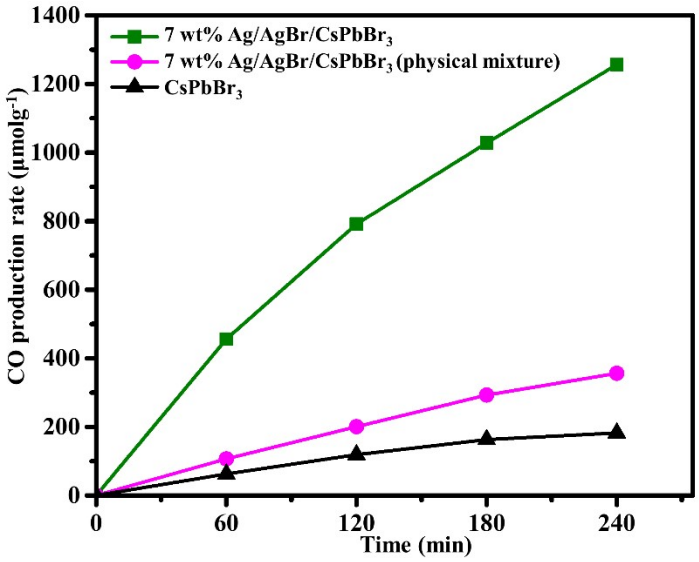

Fig. S7. CO production rates over 7 wt% Ag/AgBr/$CsPbBr_3$, 7 wt% Ag/AgBr/$CsPbBr_3$ (physical mixture) and $CsPbBr_3$ with photothermal catalysis (200 °C).

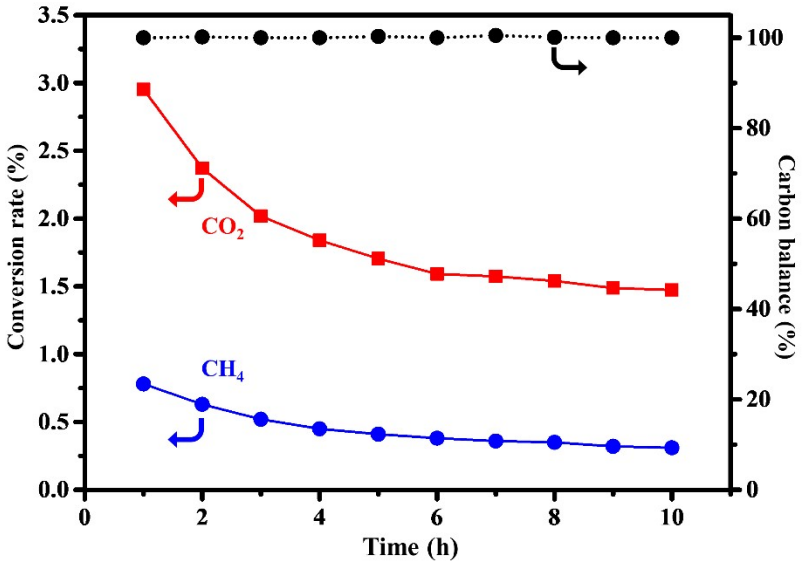

Fig. S8. The carbon balance and the conversion of CO_2 and CH_4 by the photothermal dry reforming of methane over 7 wt% Ag/AgBr/$CsPbBr_3$.

$$X_{CH_4}\% = \frac{C_{CH_4\,in} - C_{CH_4\,residual}}{C_{CH_{4in}}} \times 100\%$$

$$X_{CO_2}\% = \frac{C_{CO_2\,in} - C_{CO_2\,residual}}{C_{CO_2\,in}} \times 100\%$$

$$Carbon\ balance\ \% = \frac{C_{CO\ product} + C_{CO_2\ residual} + C_{CH_4\ residual}}{C_{CO_2\ in} + C_{CH_4\ in}} \times 100\%$$

Where $C_{i\ in}$ is the initial molar fraction of component i in the feed, and $C_{i\ residual}$ is the final molar fraction of component i in the residual gas, $C_{i\ product}$ is the final molar fraction of component i in the products gas.

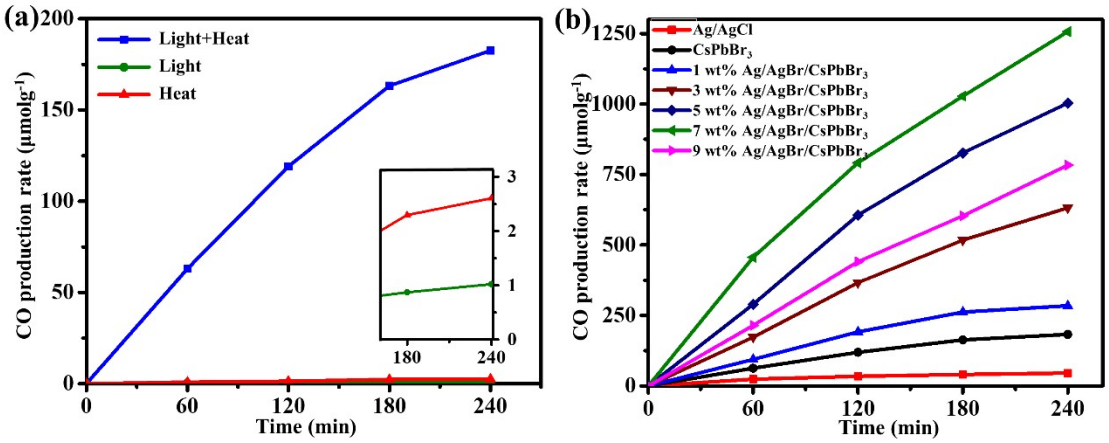

Fig. S9. (a) Catalytic activities of the $CsPbBr_3$ in CRM with photocatalysis, thermal catalysis (200 ℃) and photothermal catalysis (200 ℃). (b) CO production rate over Ag/AgCl, $CsPbBr_3$ and Ag/AgBr/$CsPbBr_3$ with photothermal catalysis (200 ℃).

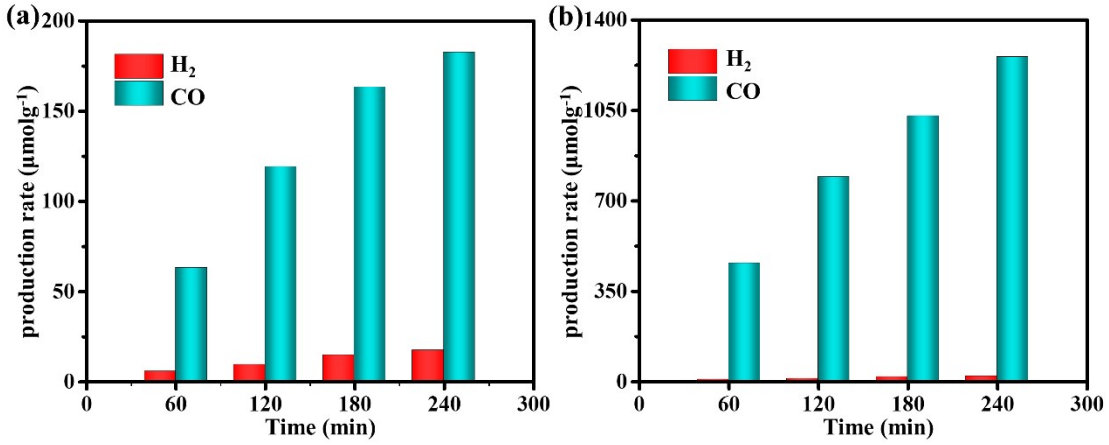

Fig. S10. (a) H_2 and CO production rate of $CsPbBr_3$ with photothermal catalysis (200 ℃). (b) H_2 and CO production rate of 7 wt% Ag/AgBr/$CsPbBr_3$ composite with photothermal catalysis (200 ℃).

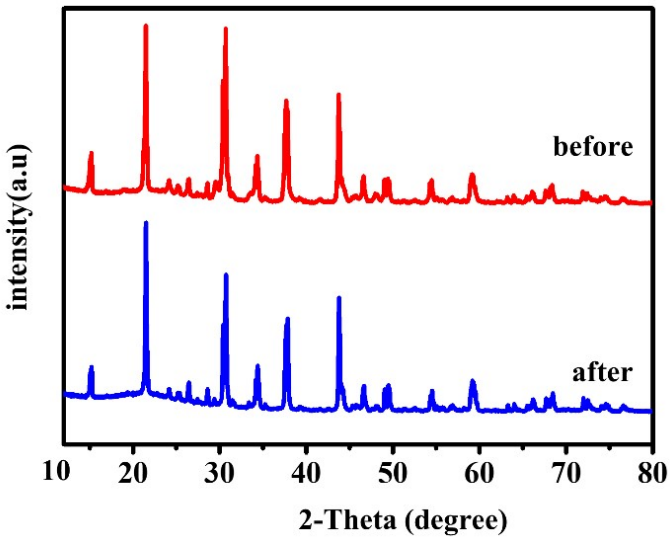

Fig. S11. XRD patterns of 7 wt% Ag/AgBr/$CsPbBr_3$ composite before and after reaction.

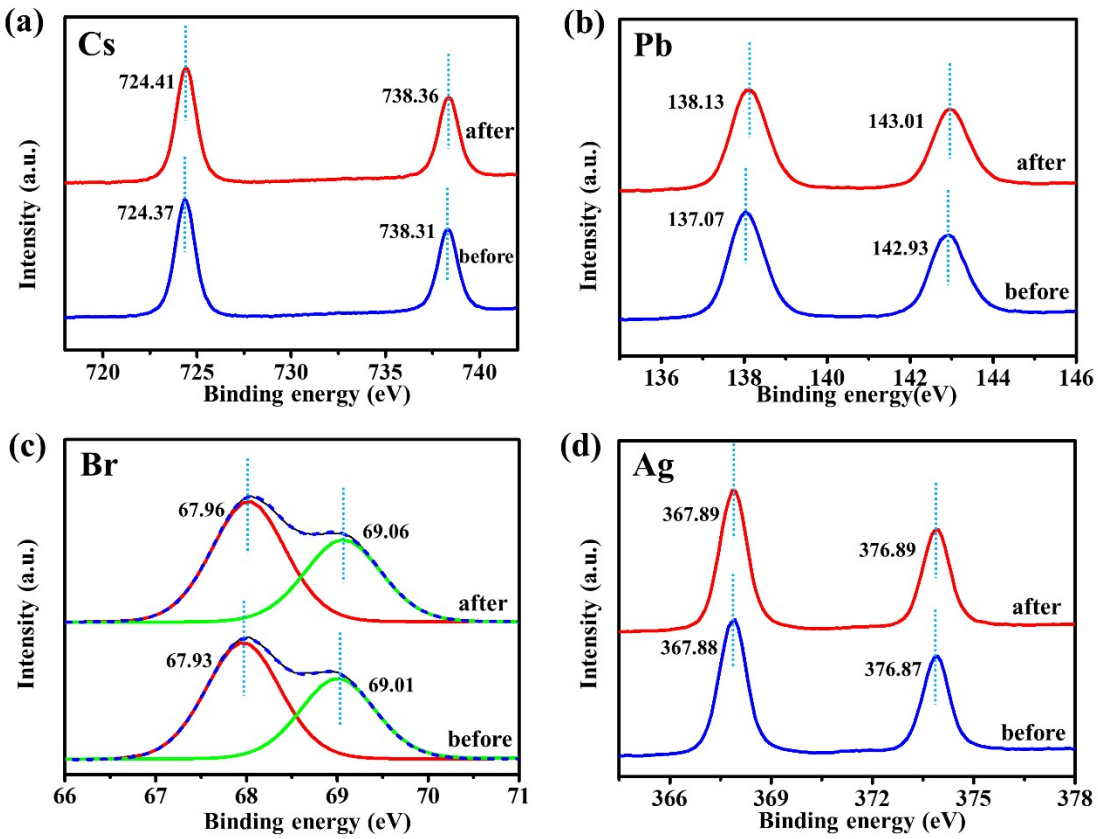

Fig. S12. XPS analysis of $CsPbBr_3$ and 7 wt% Ag/AgBr/$CsPbBr_3$ before and after reaction: (a) Cs 3d, (b) Pb 3d, (c) Br 3d, (d) Ag 3d.

Table S1. PL Decay Parameters of the $CsPbBr_3$ and 7 wt% Ag/AgBr/$CsPbBr_3$

	τ_1 (ns)	τ_2 (ns)	τ_3 (ns)	$\tau_{average}$ (ns)	χ
$CsPbBr_3$	18.169	5.188	0.934	7.494	1.146
Ag/AgBr/$CsPbBr_3$	7.780	2.460	0.820	2.898	1.117