## **Supporting Information**

## Selective production of CH<sub>4</sub> for photocatalytic CO<sub>2</sub> reduction over Pd modified BiOCl

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Fig.S1 The time course of Au, Ag, Pt, Pd modified BiOCl and pure BiOCl.



Fig.S2 (a) Mass result of main products during photocatalytic  $CO_2$  reduction using <sup>13</sup>CO<sub>2</sub> during photocatalytic reduction of CO<sub>2</sub> over 1.0 wt% Pd/BiOCl; (b)blank tests (i)with catalyst only and without (ii) catalyst, (iii) photoirradiation, (iv) CO<sub>2</sub>, and (v) photocatalyt, respectively, (vi) with catalyst, photoirraidtion,  $CO_2$  and photocatalyst over 1.0 wt% Pd/BiOCl.



Fig.S3 Recycle test of photocatalytic CO<sub>2</sub> reduction over 1.0 wt% Pd/BiOCl.



Fig.S4 Pd particle size distribution of 1.0 wt% Pd-BiOCl sample.