Supporting Information for

Selective oxidation of methane to methanol and methyl hydroperoxide over palladium modified MoO_3 photocatalyst under ambient conditions

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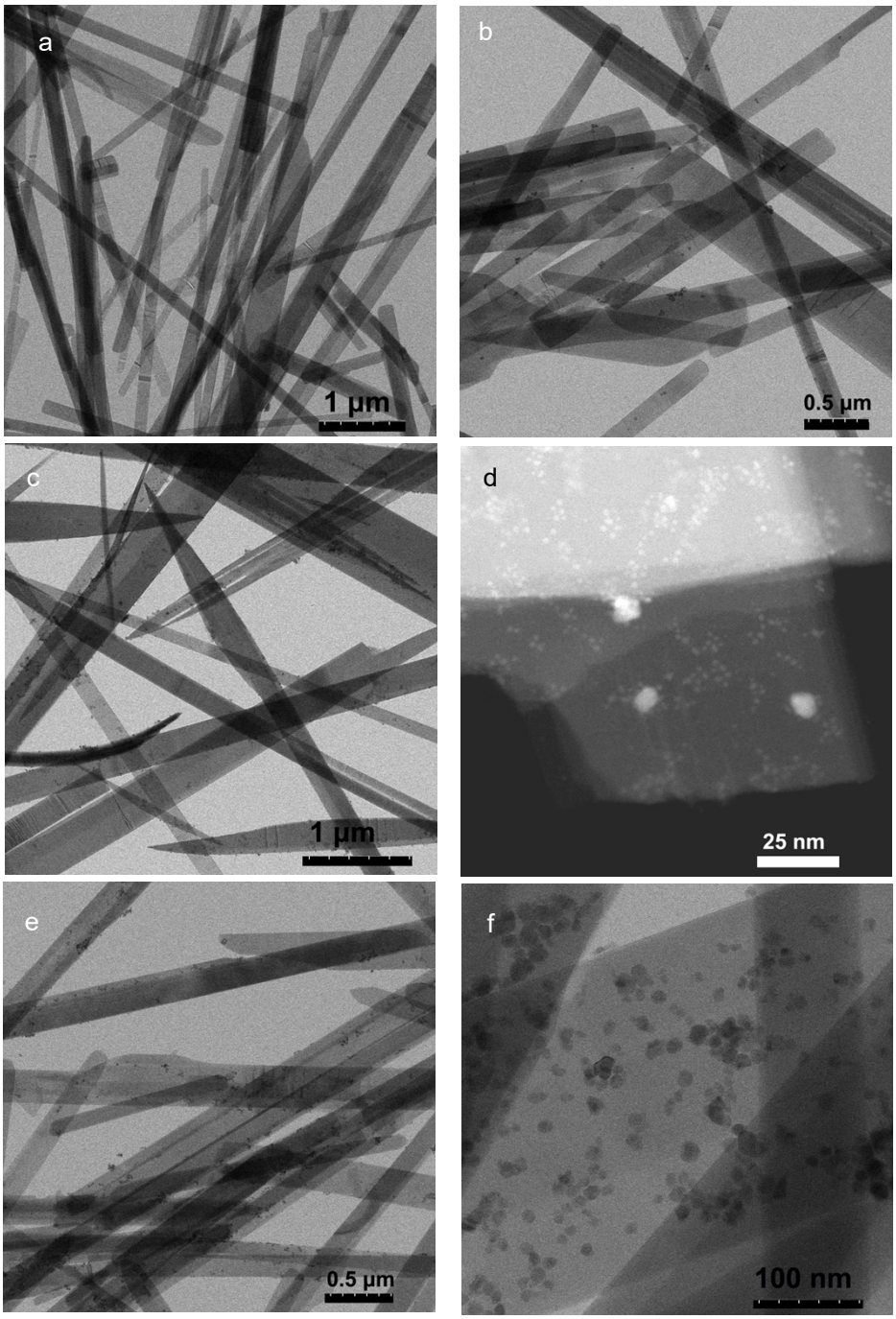

Figure S1 (a) Low magnified TEM image of MoO_3 sample, (b) Low magnified TEM image of 0.92 wt.% Pd/MoO_3 sample, (c) Low magnified TEM image of 1.86 wt.% Pd/MoO_3 sample, (d) High magnified STEM image of 1.86 wt.% Pd/MoO_3 sample, (e) Low magnified TEM image of 3.75 wt.% Pd/MoO_3 sample, (f) High magnified TEM image of 3.75 wt.% Pd/MoO_3 sample.

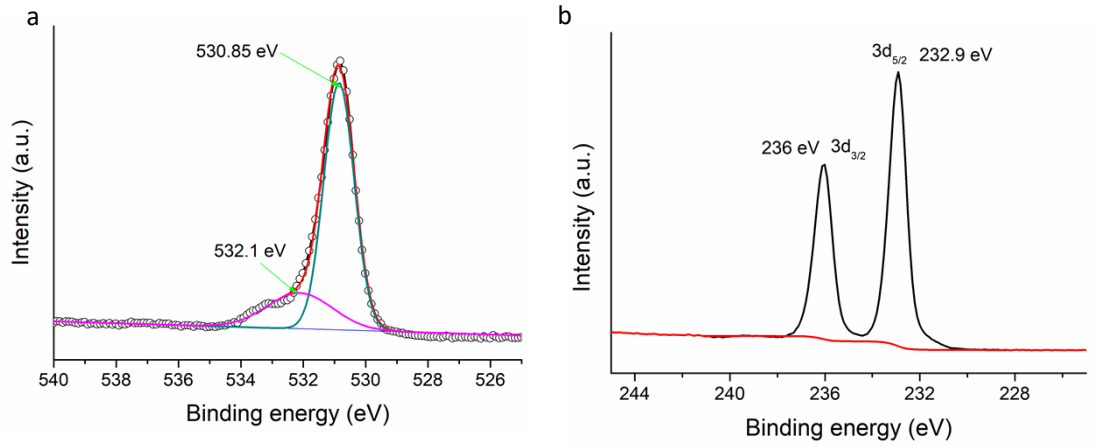

Figure S2 (a) O 1s XPS spectrum of 1.86 wt.% Pd/MoO_3 sample. (b) Mo 3d XPS spectrum of 1.86 wt.% Pd/MoO_3 sample. The peak at 530.8 eV in Figure S2a is ascribed to the lattice oxygen, while the other peak located at 532.1 eV is attributed to OH groups on the surface and possibly some signal from the support tape.

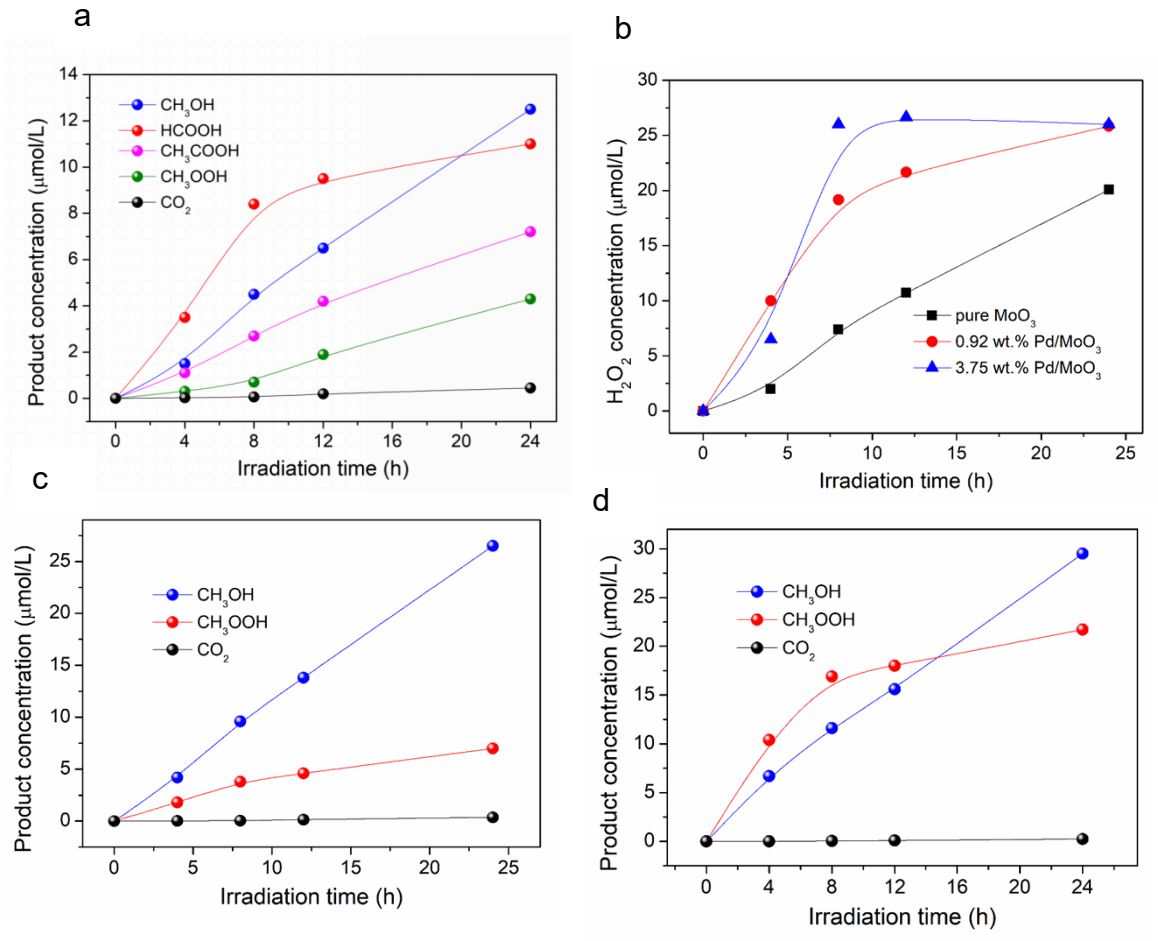

Figure S3 Photocatalytic methane conversion and H_2O_2 production performance as a function of irradiation time. (a) Methane oxidation product yields over the pure MoO_3 sample. (b) H_2O_2 yield over pure MoO_3, 0.92 wt.% Pd/MoO_3 and 3.75 wt.% Pd/MoO_3. (c) Methane oxidation products yields over 0.92 wt.% Pd/MoO_3. (d) Methane oxidation product yields over 3.75 wt.% Pd/MoO_3

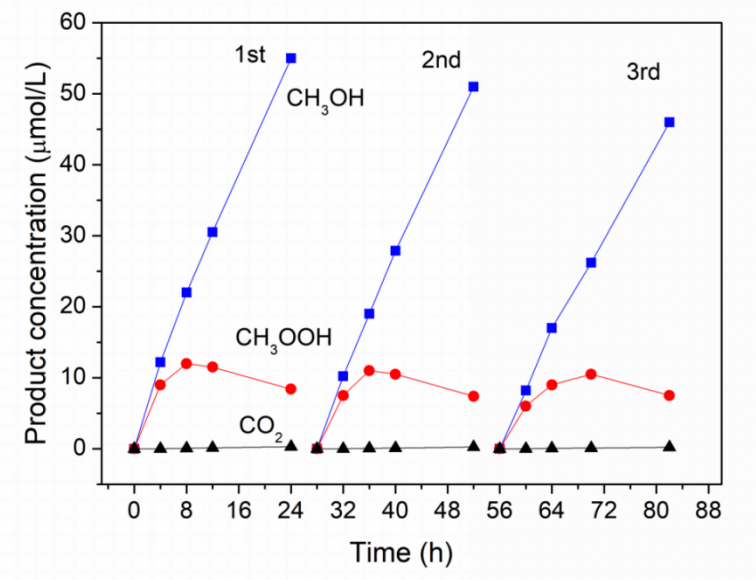

Figure S4 Three catalytic reuse cycles of CH_4 oxidation over 1.86 wt.% Pd/MoO_3 under simulated solar light irradiation illustrating the product concentration as a function of total reaction time

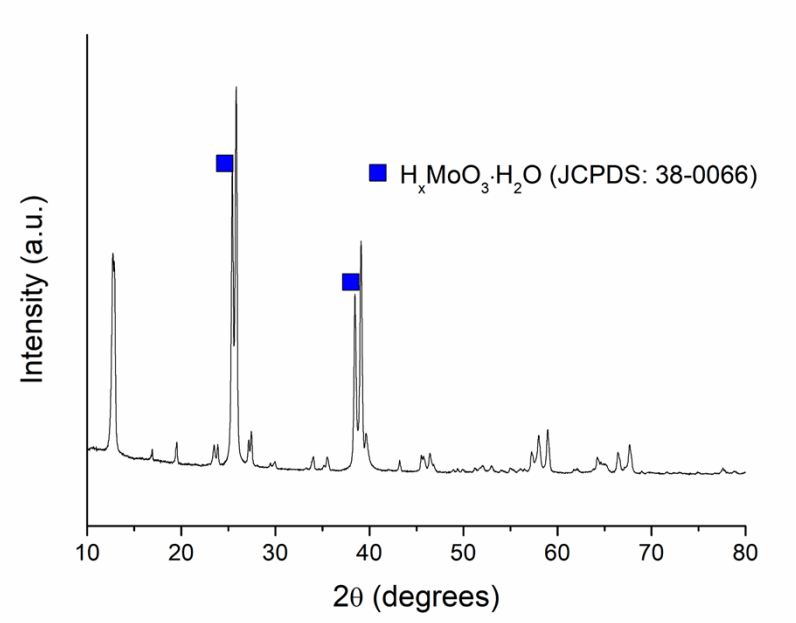

Figure S5 Powder XRD pattern of 1.86 wt.% Pd/MoO_3 sample after 72 h irradiation for methane oxidation reaction.

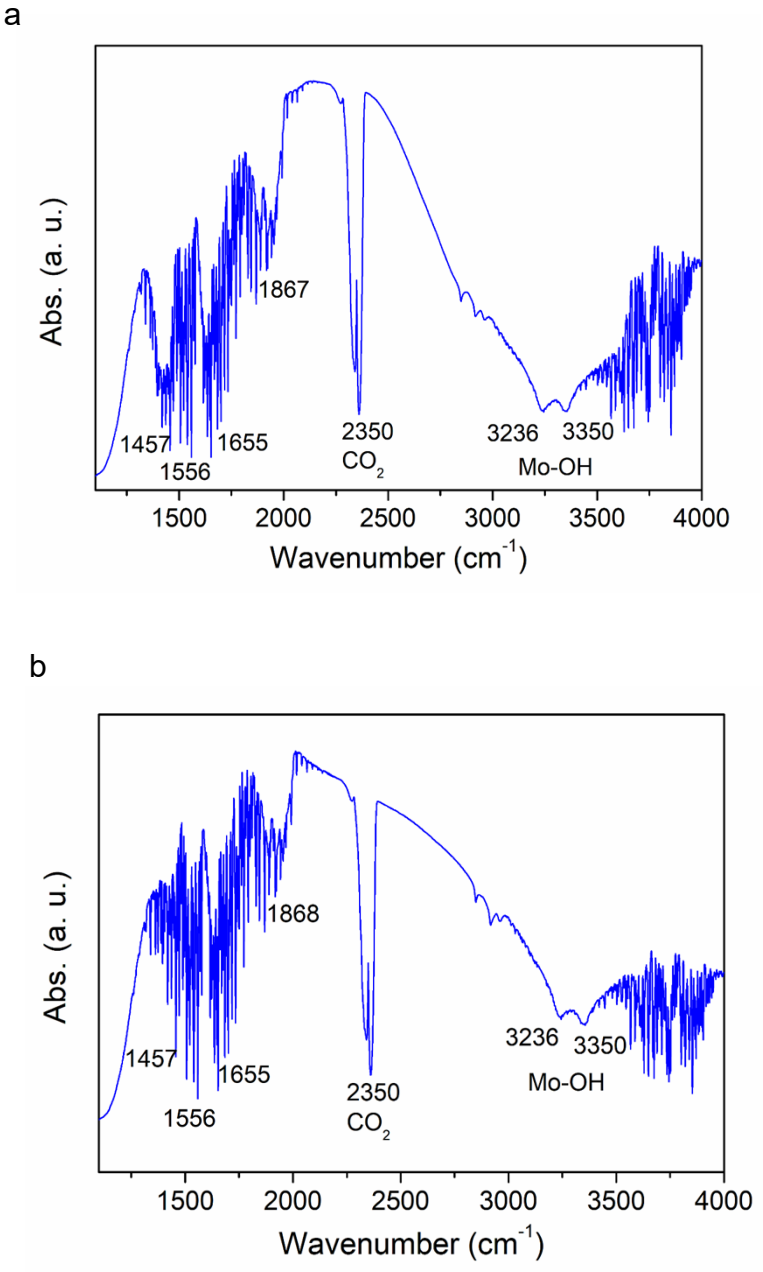

Figure S6 Background DRIFT spectrum of the pure MoO_3 (a) and 1.86 wt.% Pd/MoO_3 (b) samples.

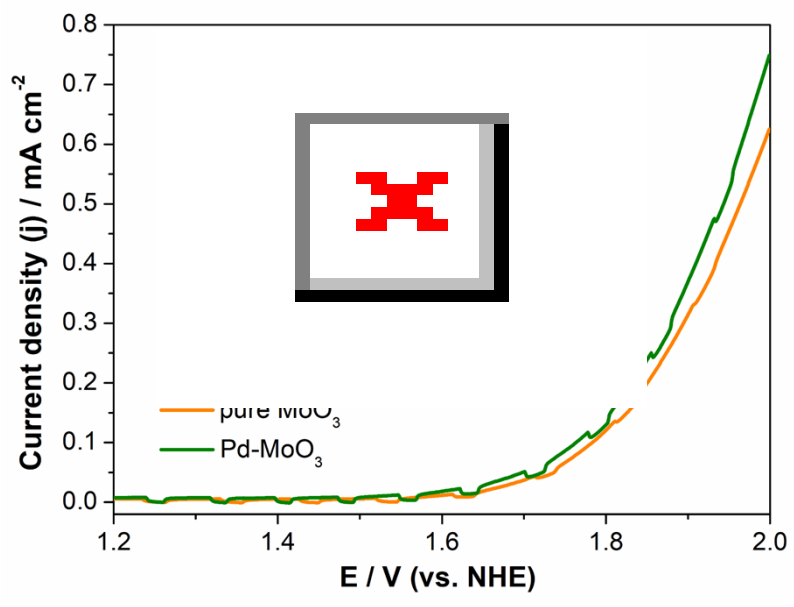

Figure S7 Anodic current−potential scans and corresponding Tafel plots of the as-prepared MoO_3 and 1.86 wt.% Pd/MoO_3 samples in 0.1 M Na_2SO_4 under 300 W chopped Xe arc lamp irradiation.