



Supplementary Materials

Thermal CO Oxidation and Photocatalytic CO₂ Reduction over Bare and M-Al₂O₃ (M = Co, Ni, Cu, Rh, Pd, Ag, Ir, Pt, and Au) Cotton-Like Nanosheets

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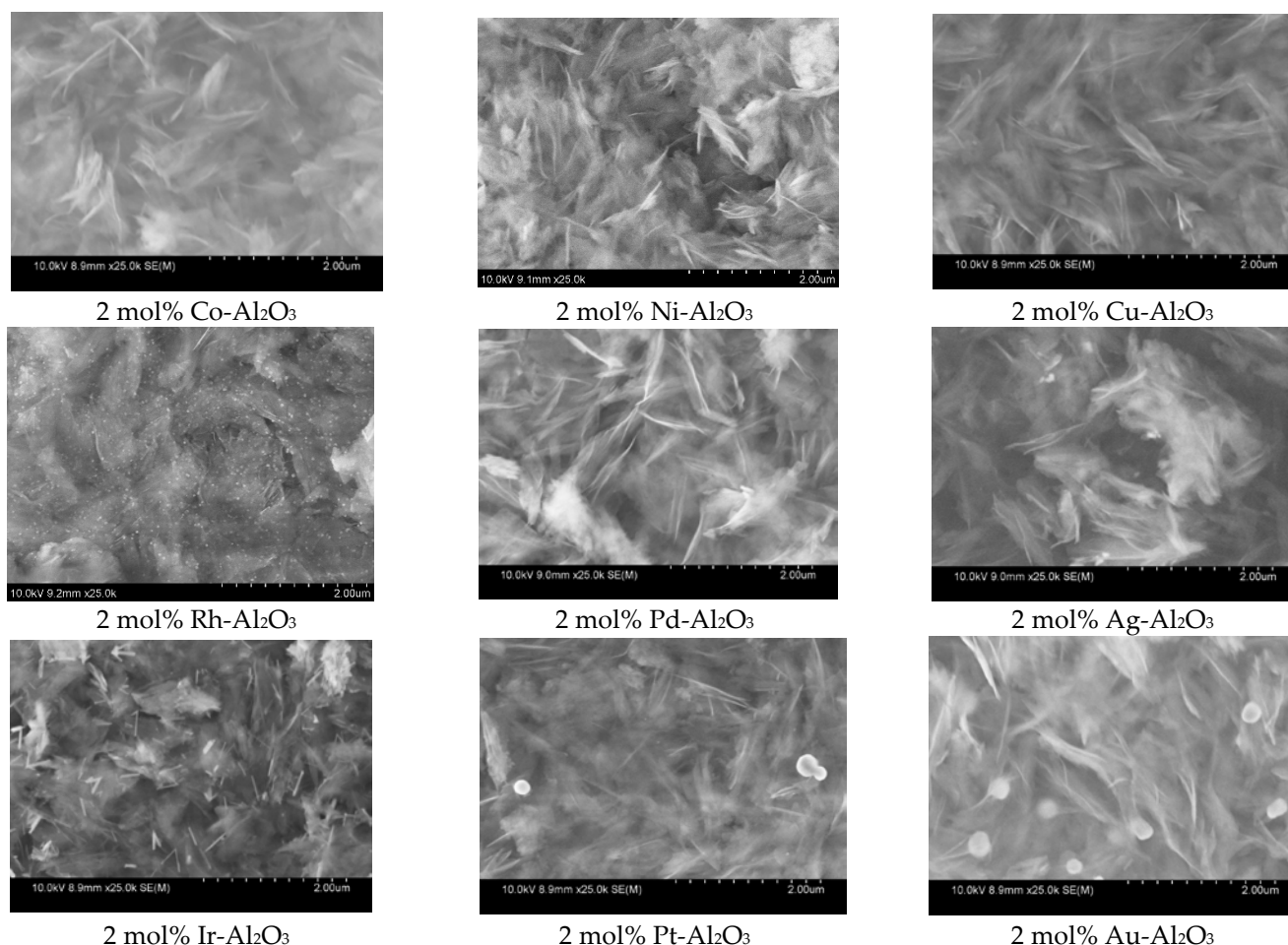
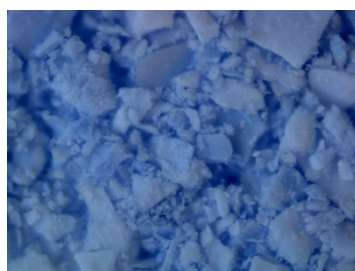
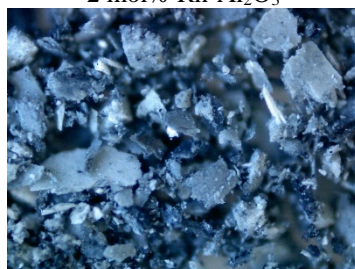


Figure S1. Scanning electron microscope (SEM) images for M-loaded Al₂O₃ nanosheets.

2 mol% Co, Ni, Cu-Al₂O₃2 mol% Rh, Pd, Ag-Al₂O₃2 mol% Ir, Pt, Au-Al₂O₃**Figure S2.** Photos for M-loaded Al₂O₃ nanosheets.Al₂O₃2 mol% Co-Al₂O₃2 mol% Ni-Al₂O₃2 mol% Cu-Al₂O₃2 mol% Rh-Al₂O₃2 mol% Pd-Al₂O₃2 mol% Ag-Al₂O₃2 mol% Ir-Al₂O₃2 mol% Pt-Al₂O₃2 mol% Au-Al₂O₃**Figure S3.** Optical microscope images for Al₂O₃ and M-loaded Al₂O₃ nanosheets.

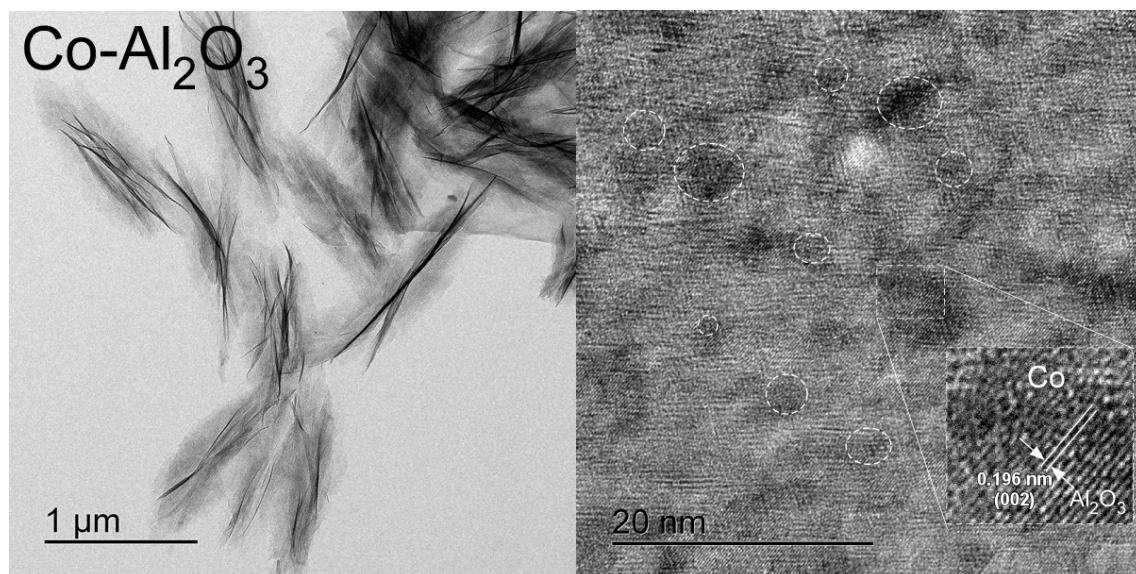
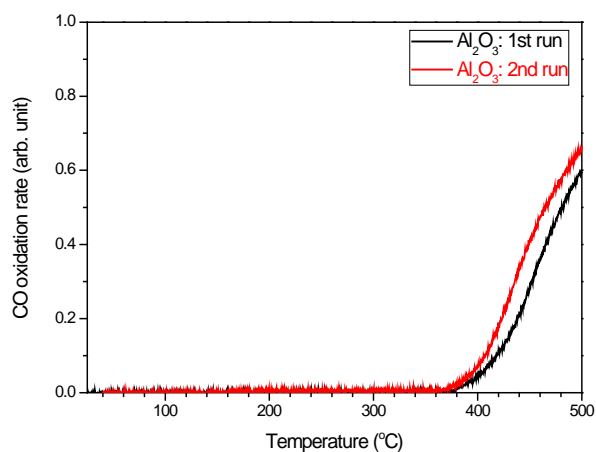
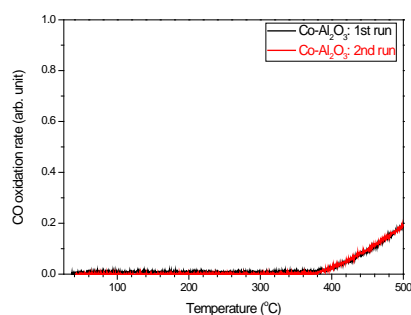
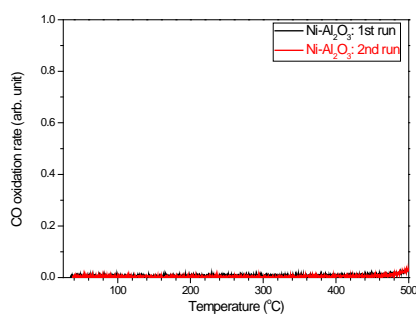
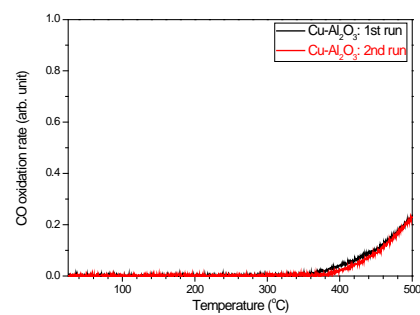
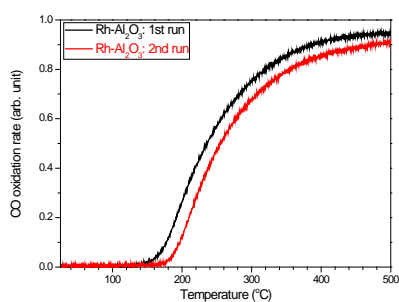
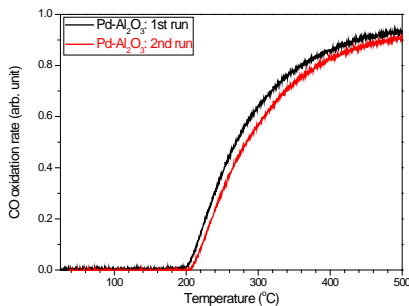
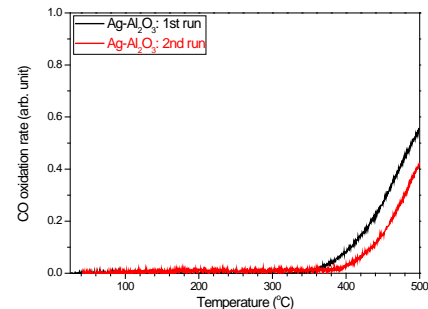
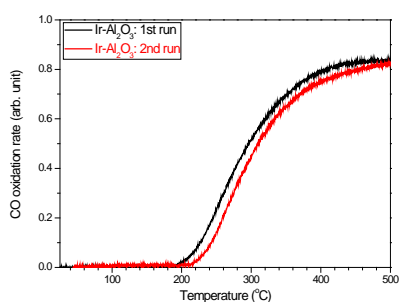
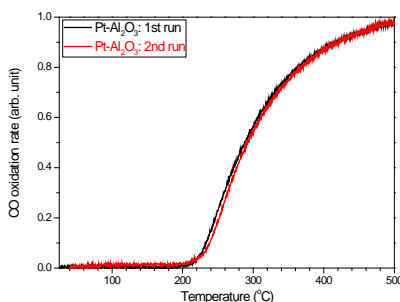
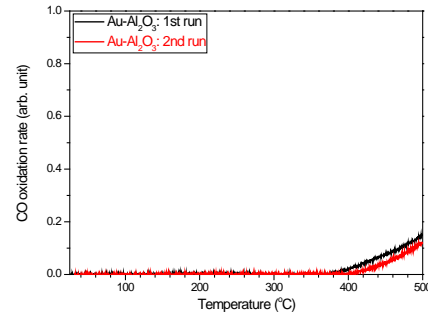


Figure S4. Transmission electron microscopic (TEM) and high-resolution TEM (HRTEM) images of $\text{Co-Al}_2\text{O}_3$ nanosheets.

bare Al_2O_3 2 mol% $\text{Co-Al}_2\text{O}_3$ 2 mol% $\text{Ni-Al}_2\text{O}_3$ 2 mol% $\text{Cu-Al}_2\text{O}_3$ 2 mol% $\text{Rh-Al}_2\text{O}_3$ 2 mol% $\text{Pd-Al}_2\text{O}_3$ 2 mol% $\text{Ag-Al}_2\text{O}_3$ 1 mol% $\text{Ir-Al}_2\text{O}_3$ 2 mol% $\text{Pt-Al}_2\text{O}_3$ 2 mol% $\text{Au-Al}_2\text{O}_3$ **Figure S5.** First and second CO oxidation profiles for Al_2O_3 and M-loaded Al_2O_3 nanosheets.

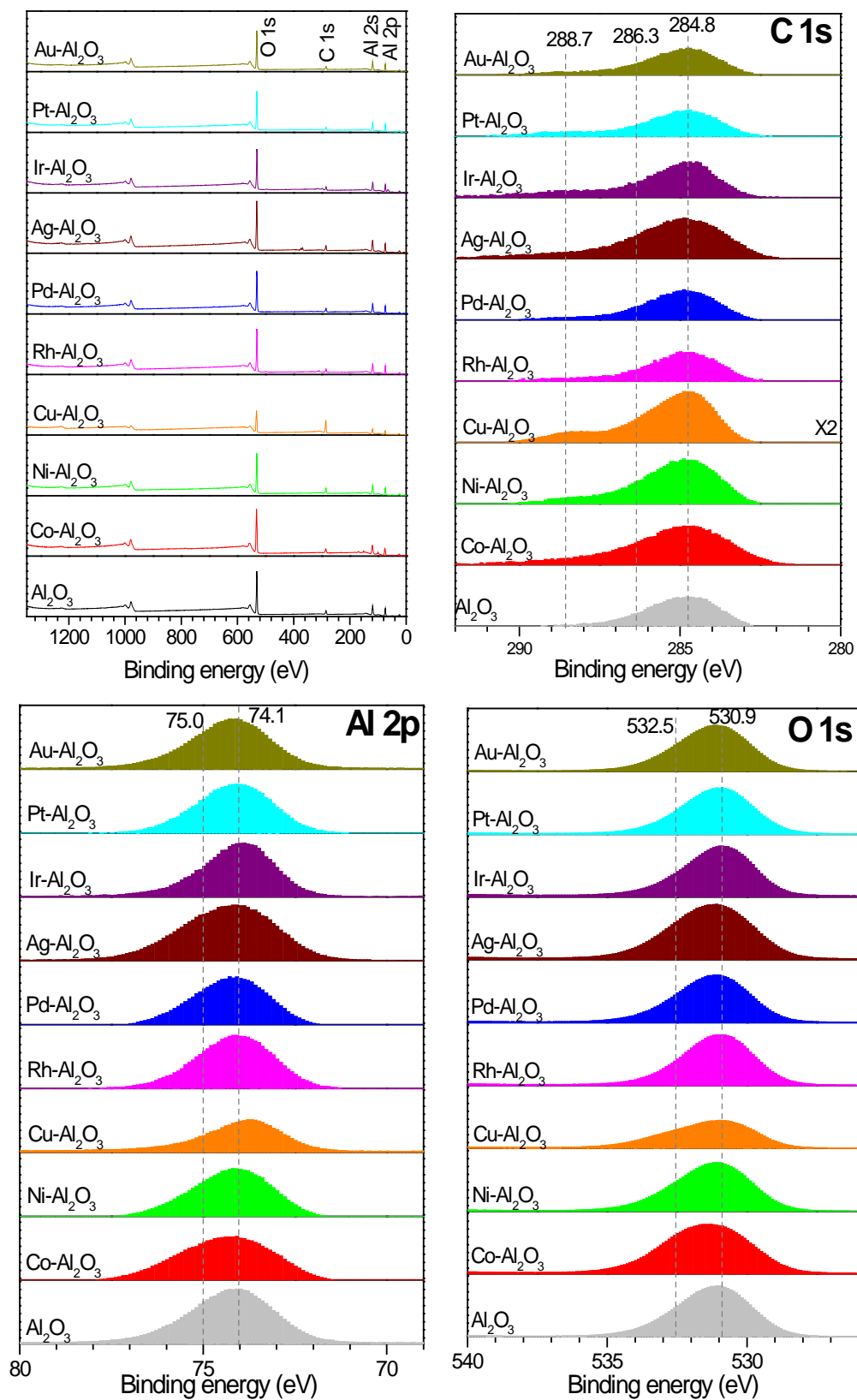


Figure S6. Survey, C 1s, Al 2p, and O 1s profile for bare and M- Al_2O_3 nanosheets.

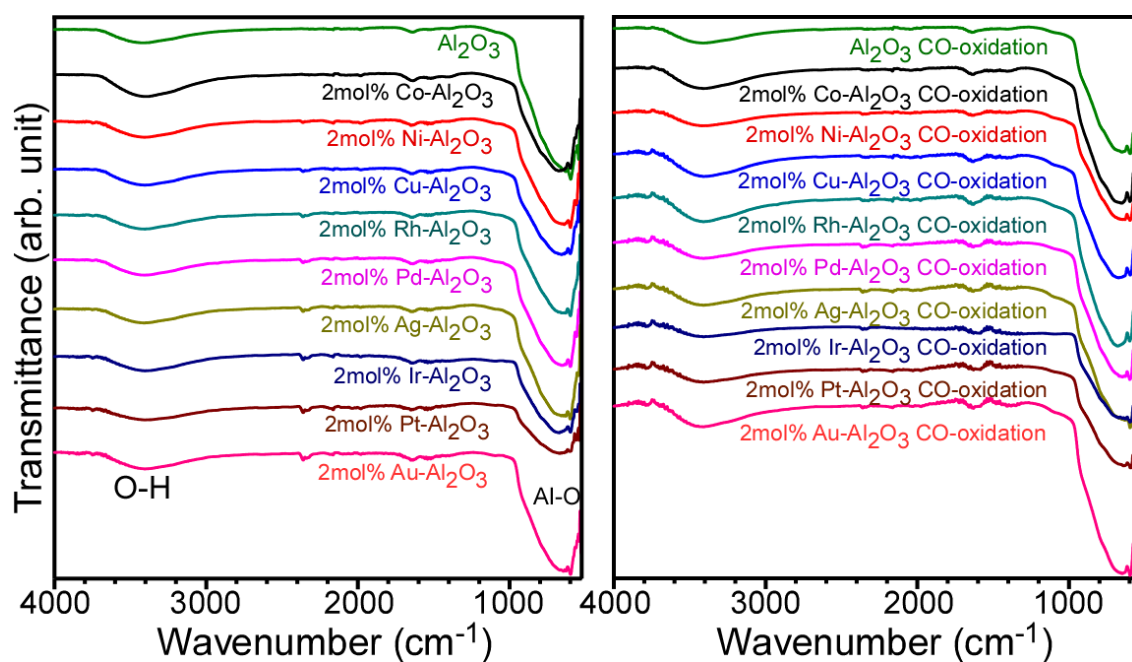


Figure S7. Fourier-transform infrared spectroscopy (FT-IR) spectra for Al_2O_3 and M-loaded Al_2O_3 nanosheets before and after CO oxidation.

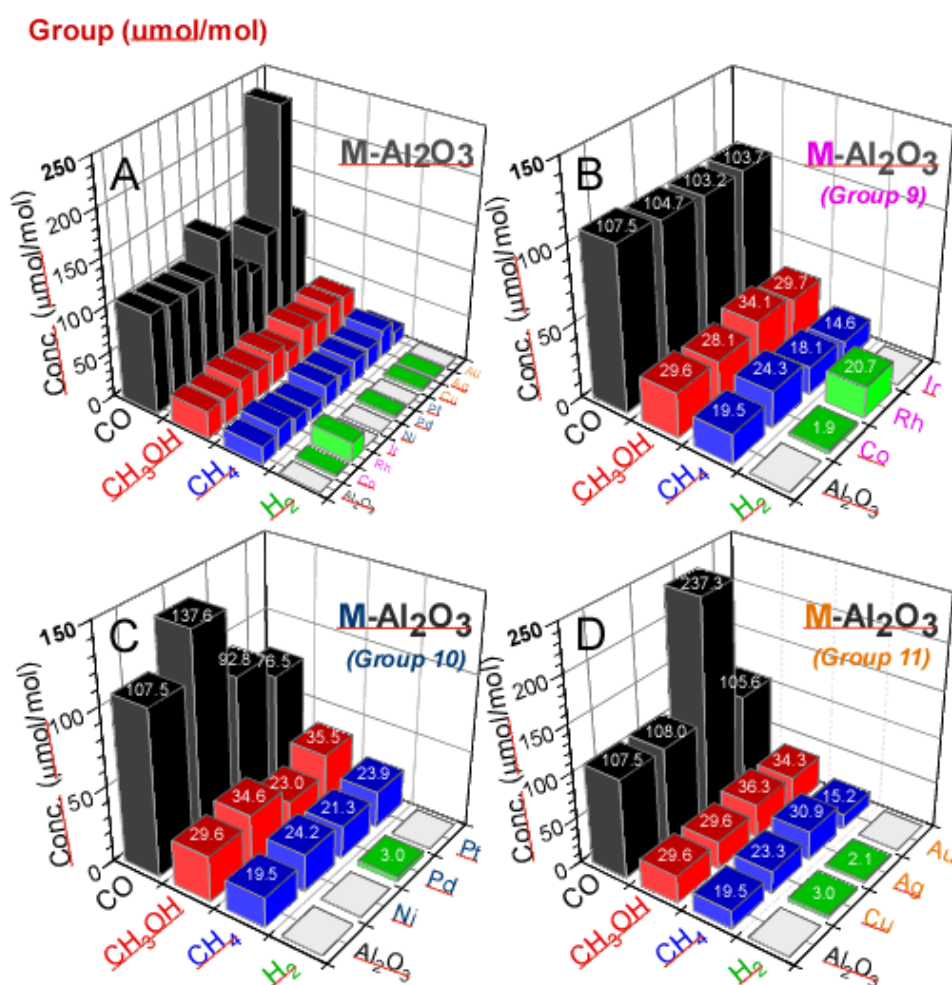


Figure S8. CO_2 reduction CO, CH_4 , and CH_3OH yields ($\mu\text{mol/mol}$) over bare and M-loaded Al_2O_3 nanosheets, group 9: (Co, Rh and Ir)- Al_2O_3 , group 10: (Ni, Pd and Pt)- Al_2O_3 , and group 11: (Ir, Pt and Au)- Al_2O_3 .

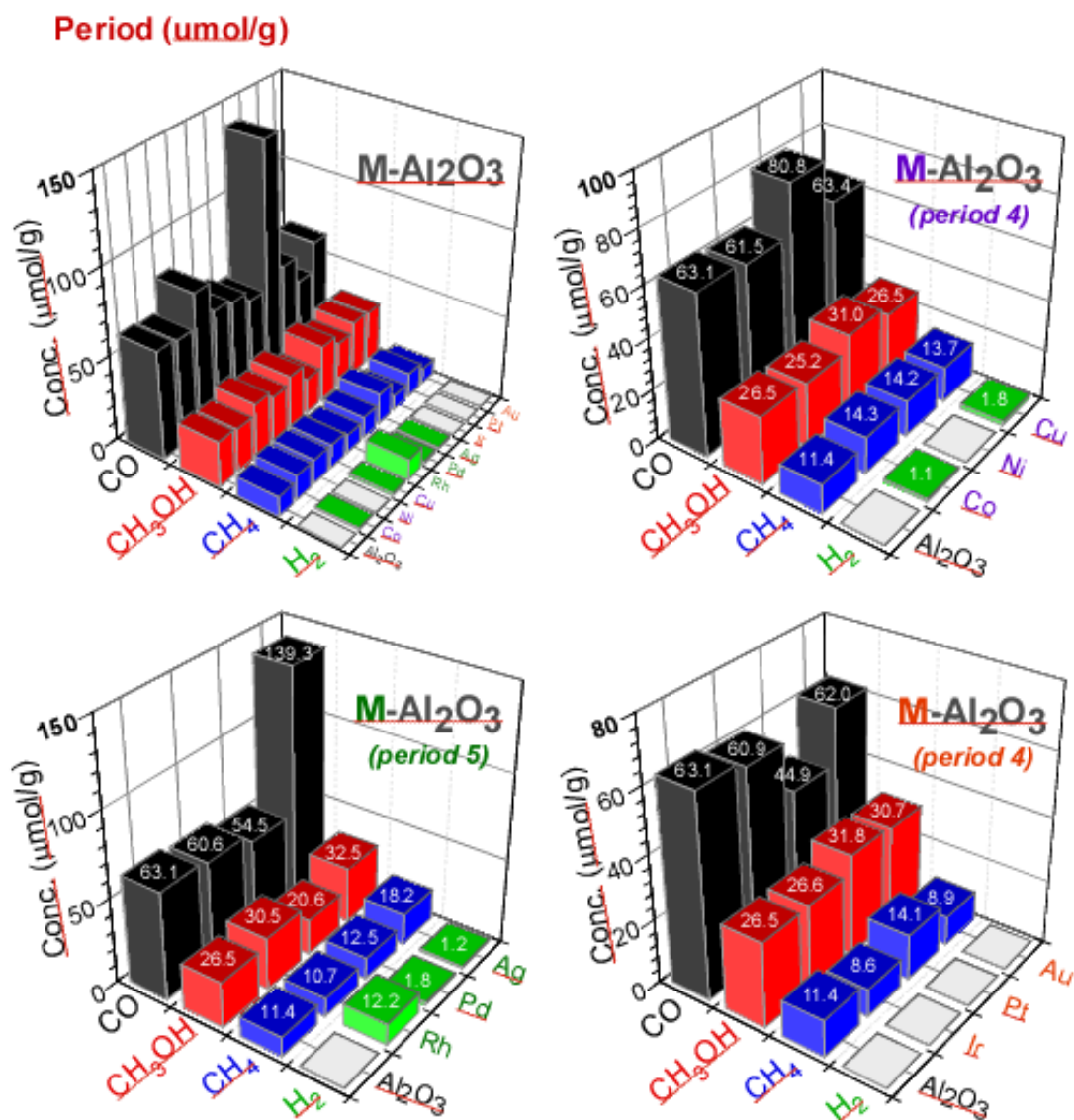


Figure S9. CO, CH₄, and CH₃OH yields (μmol/g) for over bare and M-loaded Al₂O₃ nanosheets, (Co, Ni and Cu)-Al₂O₃, (Rh, Pd and Ag)-Al₂O₃, (Ir, Pt and Au)-Al₂O₃.