

Nanocrystal Bilayer for Tandem Catalysis

Yusuke Yamada^{1,3}, Chia-Kuang Tsung^{1,2}, Wenyu Huang^{1,2}, Ziyang Huo¹, Susan E. Habas^{1,2}, Tetsuro Soejima¹, Cesar E Aliaga², Gabor A. Somorjai^{1,2}, Peidong Yang^{1,2}*

1. Department of Chemistry, University of California, Berkeley, Berkeley, California 94720, USA

2. Materials Sciences Division, Lawrence Berkeley National Laboratory, 1 Cyclotron Road, Berkeley, California 94720, USA

3. Current Address: Department of Material and Life Science, Graduate School of Engineering, Osaka University 2-1 Yamada-oka, Suita, Osaka 565-0871

*e-mail: p_yang@berkeley.edu

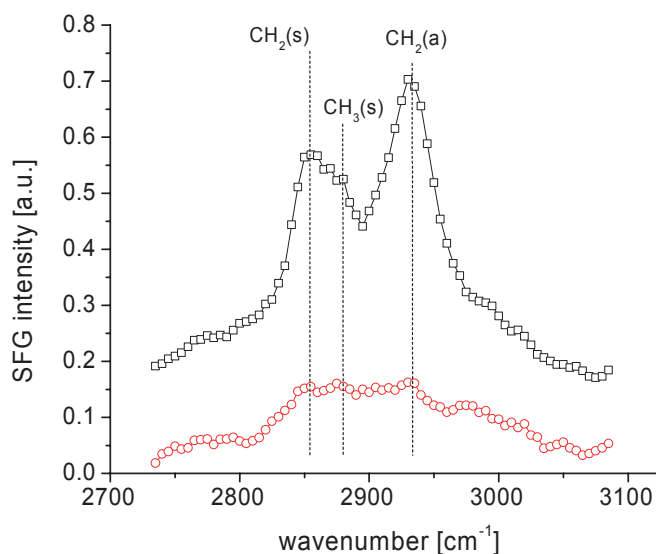


Figure S1. Sum frequency generation spectra of an LB film of oleylamine-coated Pt nanoparticles after UV/ozone treatment for 200 min (black line: sample as prepared, red line: UV/ozone treated sample)

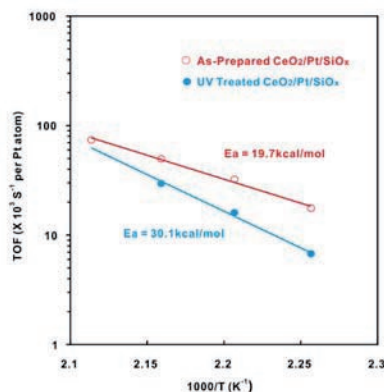


Figure S2. Turn-over frequency on CO oxidation over CeO₂ on Pt nanoparticles (open circle; as prepared sample, closed circle; plasma treated sample).

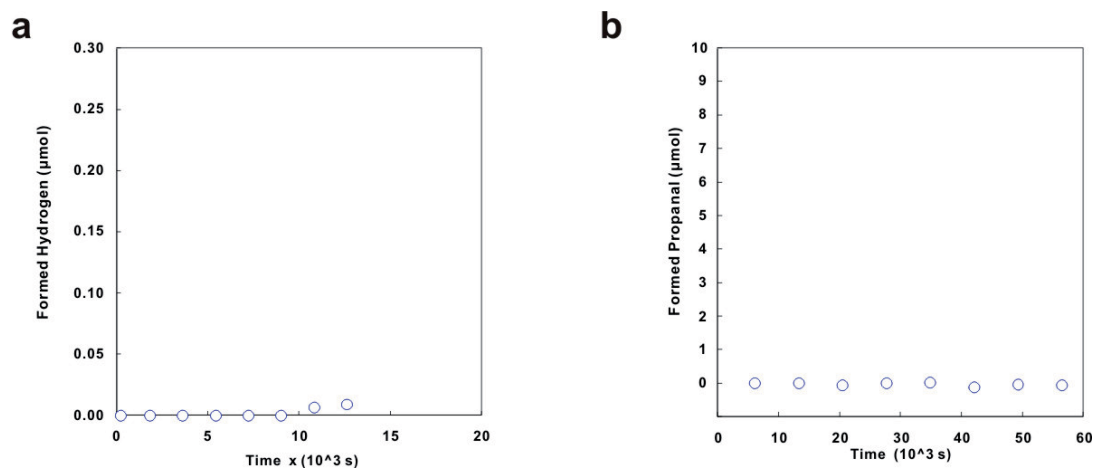


Figure S3. The as-prepared catalyst showed no catalytic activity for the reactions due to the lack of clean metal-metal oxide interfaces. (a) Hydrogen produced as a function of reaction time over Pt/CeO₂ interface without UV treatment at 190 °C by catalytic thermal decomposition of methanol. (b) Propanal produced as a function of reaction time over CeO₂-Pt-SiO₂ without UV treatment at 190°C from ethylene and MeOH.

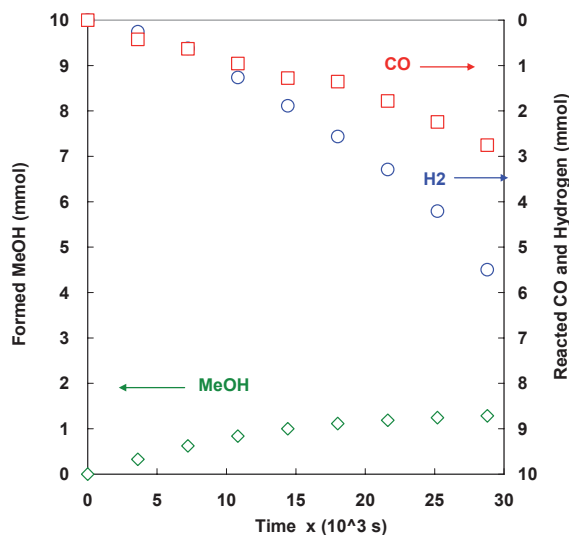


Figure S4. CO hydrogenation with CO and H₂ (without ethylene) as a function of reaction time over the Pt nanocubes on SiO₂. (open square; reacted CO, open circle; reacted H₂, open diamond; formed MeOH)

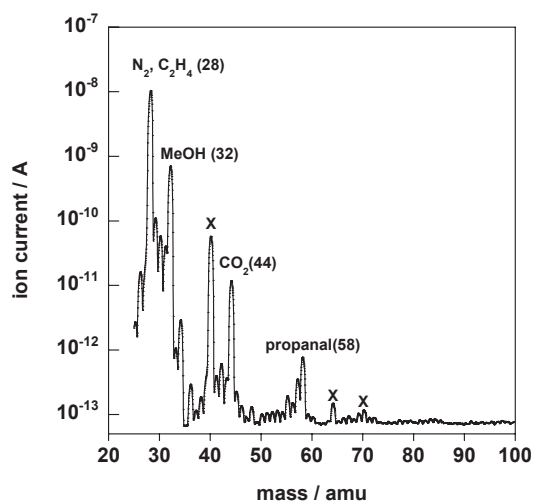


Figure S5. Mass spectrogram of the outlet gas after 24 hours reaction. (the peaks designated “x” are background peaks.)

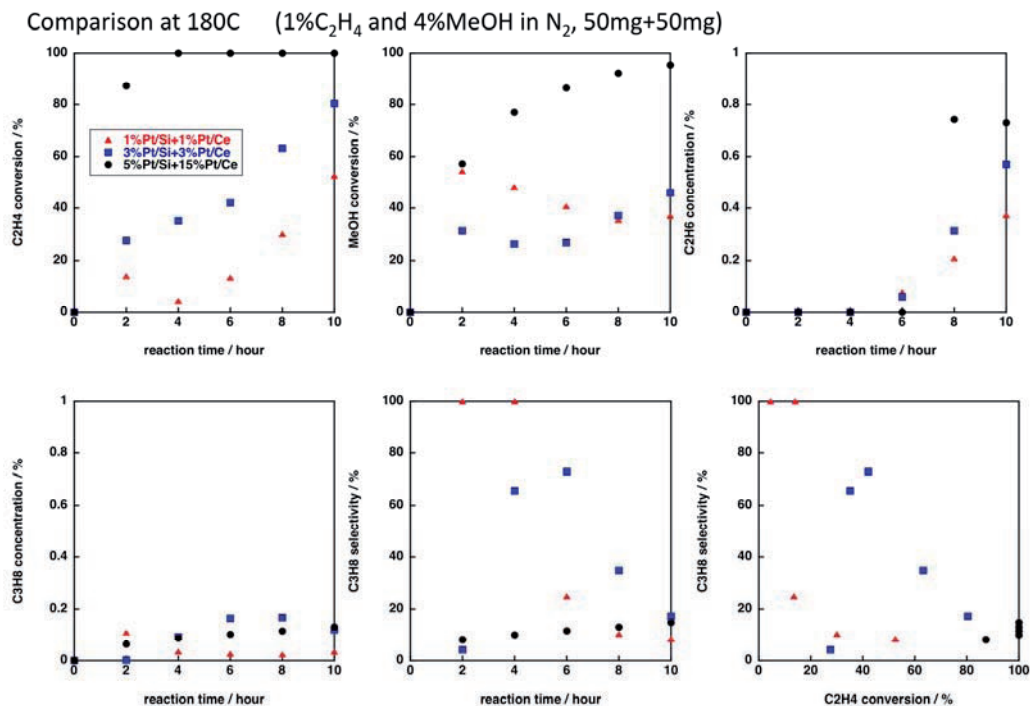


Figure S6. Time courses of ethylene and MeOH conversions and ethane and propane concentrations in an effluent over the mixture of Pt/SiO₂ and Pt/CeO₂ in a cyclic reactor. (50 mg each, 180°C).

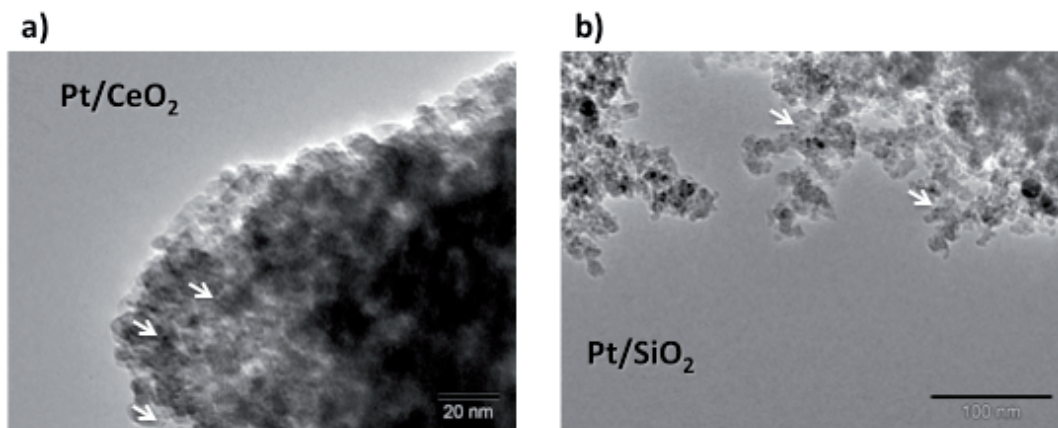


Figure S7. TEM images of 15%Pt/CeO₂ and of 10%Pt/SiO₂.