Supplementary Material (ESI) for Analytical Methods

Photocatalytic reduction of CO_2: A brief review on product analysis and systematic methods

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Table S1 Analytical conditions for gas product

Equipment	Agilent 7890A GC
Valve box heater	100 °C
Inlet	Heater (250 °C) Split ratio (2:1) total flow of 15 mL/min septum purge flow of 3 mL/min
Sample volume	0.25 mL
Column	Hayesep Q 80-100 (2.74 m L × 2.0 mm ID × 1/8 in OD) Molsieve 5Å 80-100 (2.74 m L × 2.0 mm ID × 1/8 in OD)
Carrier gas	He, constant flow of 20 mL/min
Oven	60 °C (15 min), post-run at 180 °C (5 min)
Methanizer	Ni Catalyst (350 °C)
Detector	FID-Front, off, He makeup flow of 10 mL/min FID-Back, 250 °C, H_2 flow of 40 mL/min, Air flow of 350 mL/min TCD-Third, 200 °C, Reference flow of 30 mL/min
Aux Heater	375 °C
Valve events	0.01min: Valve 1 on (start of sampling) 0.25min: Valve 1 off (finish of sampling) 2.5min: Valve 2 on (switched for CO_2 to bypass MolSieve column) 3 min: Valve 3 on (start of CO_2 vent) 7min: Valve 3 off (finish of CO_2 vent) 10 min: Valve 2 off (switched to send the separated remaining gases from MolSieve column to TCD)

Table S2 Analytical conditions for alcohols in liquid phase

Equipment	Agilent 7890A GC
Inlet	Heater (125 °C), Splitless, total flow of 43 mL/min, septum purge flow of 3 mL/min
Injection volume	1.0 μL
Column	DB-Wax (30 m × 0.53 mm ID × 1 μm thickness film)
Carrier gas	He, constant flow of 20 mL/min
Oven	40 °C (5 min), 40-180 °C (20 °C /min), 180 °C (3 min)
Detector	FID-Front, 200 °C, H_2 flow of 40 mL/min, Air flow of 350 mL/min, He makeup flow of 25 mL/min, column+makeup of 45 mL/min

	FID-Back, off, He makeup flow of 10 mL/min TCD-Third, off, He reference flow of 10 mL/min

Table S3 Analytical conditions for aldehyde-DNPH in liquid phase

Equipment	Agilent 1260 HPLC
Column	Eclipse Plus C18 (ID: 4.6 mm × 100 mm, particle size: 3.5 μm)
Injection volume	3 μL
Mobile phase	60 v% acetonitrile in H_2O
Fow rate	1.5 mL/min
Temperature	40 °C
Detector	VWD (360 nm)
Analysis time	5 min

Table S4 Analytical conditions for carboxylic acid in liquid phase

Equipment	Agilent 1260 HPLC
Column	PL Hi-Plex H (ID: 7.7 mm × 300 mm, particle size: 8 μm, Varian)
Injection volume	20 μL
Mobile phase	5 mM H_2SO_4
Fow rate	0.6 mL/min
Temperature	55 °C
Detector	VWD (210 nm)
Analysis time	17 min