

Application Data Sheet

No.9

Analysis of Reaction Products in Artificial Photosynthesis Research

Artificial photosynthesis refers to a technique for the manufacture of high-energy substances using energy from sunlight. It is expected to become the 4th type of sunlight-based renewable energy after solar cells, solar heating, and biomass technologies.

This data sheet introduces an example of the simultaneous analysis of CO and H2, generated in a photochemical carbon dioxide reduction utilizing a photo-catalyst, using the Shimadzu Tracera High-Sensitivity Gas Chromatograph system.

Instruments Used and Analysis Conditions

Instruments Used	
Software	GCsolution
Gas chromatograph	Tracera (GC-2010 Plus A + BID-2010 Plus)

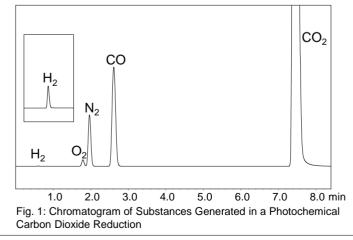
GC Gas Chromatograph

Analysis Conditions	
Column Microp	backed ST
Column temperature	35 °C(2.5 min) – 20 °C/min – 180 °C (0.5 min) Total.10.25 min
Carrier gas controller	Pressure
Pressure program	250 kPa (2.5 min) – 15 kPa/min – 360 kPa (0.42 min) (He)
Injection mode	Split (1:10)
Injection port temperature 150 °C	
Detector temperature	280 °C
Discharge gas volume	70 mL/min
Injection volume	50 µL

Results

Fig. 1 shows a chromatogram of substances generated in a photochemical carbon dioxide reduction. Fig. 2. shows a graph of CO and H2 production plotted against reaction time. It was confirmed that CO production increased sharply for the first 30 minutes of reaction time, after which it shifted to a more gradual increase.

The BID detector in the Tracera system can provide simultaneous high-sensitivity measurements of CO and H2. This detector can detect all components eluted from the column, thus enabling acquisition of a variety of information as well as the target component measurements.



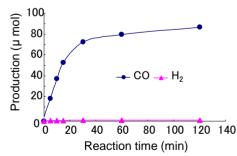


Fig. 2: CO and H2 Production Versus Reaction Time

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