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**
- GCsolution
- Gas chromatograph: Tracera (GC-2010 Plus A + BID-2010 Plus)

**Analysis Conditions**
- Column: Micropacked 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. 1: Chromatogram of Substances Generated in a Photochemical Carbon Dioxide Reduction

Fig. 2: CO and H2 Production Versus Reaction Time

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