

## Quantitative Analysis of Carbon in Polysilicon

### Background / Challenges - Measurement of carbon content by morphology in polysilicon

#### Background

Polysilicon, the raw material for silicon wafers, requires strict control of carbon content, which affects its conductivity. As higher purity silicon wafers are required, it is important to understand the amount of carbon contained in polysilicon supplied as a material. However, some carbon is present as carbonate and some is attached as CO<sub>2</sub>, making it very difficult to distinguish between them and analyze the extremely small amount of carbon.


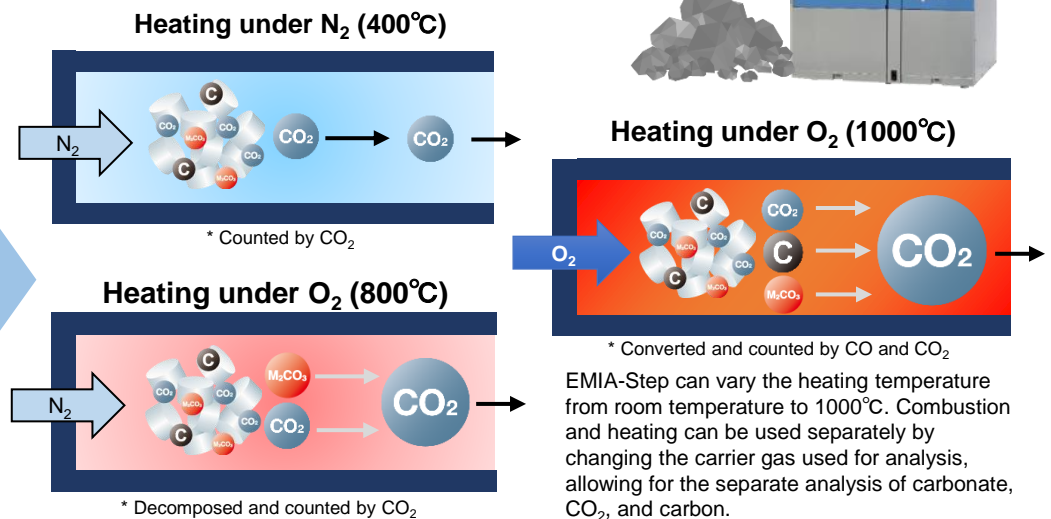
#### Challenges

With HORIBA's EMIA-Step Carbon/Sulfur analyzer, the sample is heated in an oxygen atmosphere, and the carbon contained in the sample is quantitatively analyzed by an infrared detector as CO/CO<sub>2</sub> gas. However, in the case of combustion reactions, both carbon alone and carbonate can only be quantified as total carbon content, including CO<sub>2</sub>, making it difficult to distinguish between them.

### Solution from HORIBA

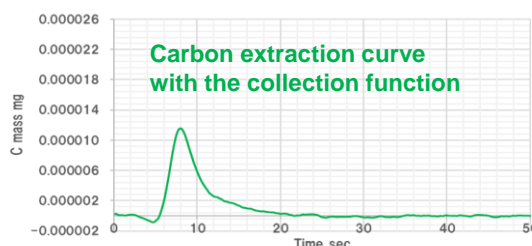
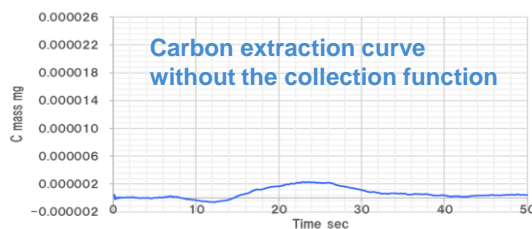
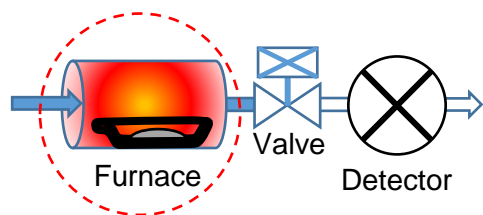
**A need from a polysilicon manufacturer**

"We would like to measure the amount of carbon in ultra-low amounts as impurities, but since CO<sub>2</sub> adhering to the surface is also included, we cannot determine the actual amount of carbon."

### Gas Collection Function - For ultra trace concentration measurement

EMIA-Step's sample combustion furnace has a sealed structure, which is unique in the industry. This structure allows for heating under higher pressure, enabling the analysis of steel samples. The sealed design also makes it possible to analyze trace amounts of gases with high accuracy by collecting the continuously generated gases inside the furnace for a period of time and then releasing them to the detector.



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