

Application News

No. 072

Total Organic Carbon Analysis

Carbon Measurement of Metal Powder Battery Material

Various metal powders are used in battery electrode materials, depending on the type. Because batteries are used in large quantities in familiar products such as mobile phones, notebook computers, and automobiles, a high level of safety is necessary. Therefore, high purity is demanded in the metal materials used as materials.

Quick, simple measurement of the concentration of carbon contained in metal powders is possible by using a Shimadzu total organic carbon (TOC) solid sample system.

This article introduces an example of total carbon measurement of lithium cobalt oxide, which is widely used as a positive electrode material in lithium ion batteries, by using Shimadzu solid sample system consisting of a TOC-L_{CPH} total organic carbon analyzer and SSM-5000A solid sample combustion unit.

M. Tanaka

■ Analysis Method

Approximately 100 mg of a commercial lithium cobalt oxide (Fig. 2) powder reagent was placed in the sample boat of the SSM-5000A and weighed, and total carbon (TC) was measured. Next, analysis samples were prepared by adding glucose as a carbonaceous substance to 100 mg to 200 mg of lithium cobalt oxide so as to obtain carbon concentrations of 5.0 %, 1.0 %, and 0.2 %, and the TC of the samples was measured.

For calibration of the analyzer, a calibration curve was prepared by TC measurement of a glucose powder reagent (carbon concentration: 40 %).



Fig. 1 Lithium Ion Battery



Fig. 2 Lithium Cobalt Oxide

Table 1 Measurement Conditions

Analyzer	: TOC solid sample system (TOC-L _{CPH} TOC analyzer + SSM-5000A solid sample combustion unit)
Cell length	: Short cell
TC oxidation method	: Combustion catalytic oxidation (Combustion temperature: 900 °C)
Measurement item	: TC (Total carbon)
Calibration curve	: One point calibration curve by glucose powder reagent (Carbon concentration: 40 %)
Sample	: Lithium cobalt oxide (Lithium cobalt (III) oxide, LiCoO ₂) reagent
Additives	: 5 % addition, glucose powder; 1 % addition, 5 %C glucose solution; 0.2 % addition, 0.5 %C glucose solution

■ Analysis Results

Table 2 shows the results of measurements of the lithium cobalt oxide and the samples with the added carbonaceous substance. Fig. 3 shows the measurement charts. It can be understood that the samples with the added carbonaceous substance were measured with high accuracy.

Table 2 Measurement Results

Sample	TC Measurement Value (%C)
Lithium Cobalt Oxide	0
Lithium Cobalt Oxide + 0.2 % Glucose	0.209
Lithium Cobalt Oxide + 1.0 % Glucose	0.999
Lithium Cobalt Oxide + 5.0 % Glucose	5.02

Analysis Data

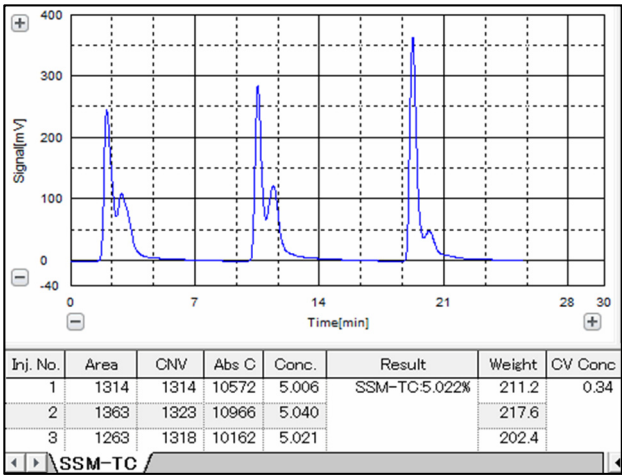
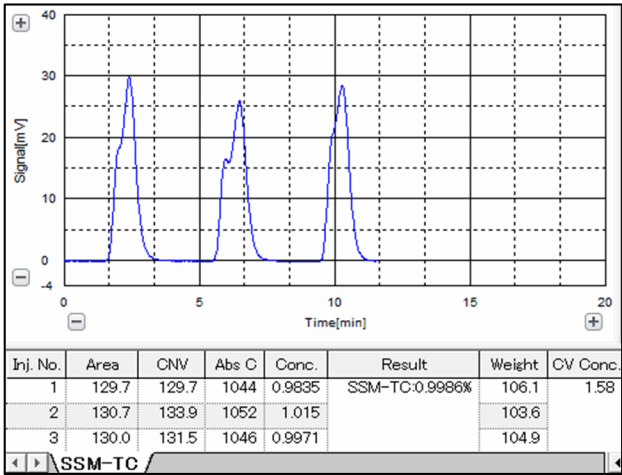
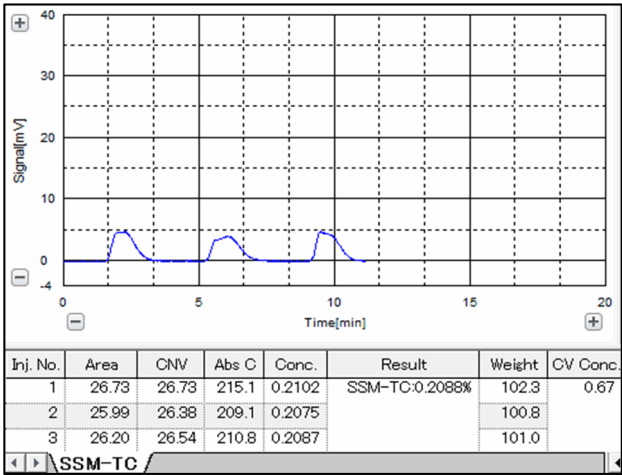
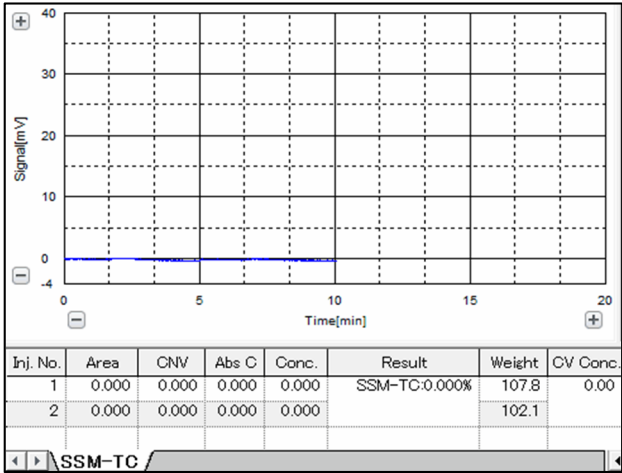
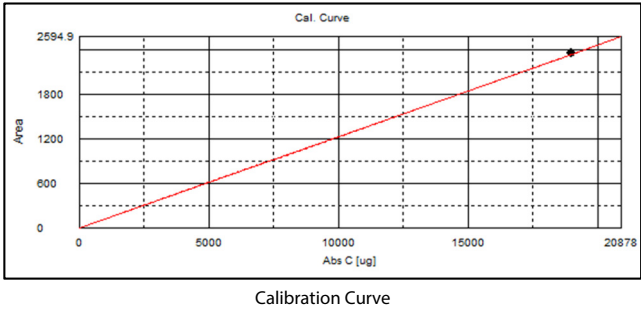


Fig. 3 Measurement Data



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Some products may be updated to newer models.



> SSM- 5000A
Solid Sample Combustion Unit

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