

## Surface Carbon Measurement on Aluminum Foil Samples

### Introduction

Concentration of surface carbon on aluminum foil is crucial control parameter in food industry with regard to hygiene point. Lubrication during the process of the aluminum foil production is the main source of the surface carbon. Therefore, surface carbon needs to be determined and controlled to produce clean aluminum foils for health and safety purposes.

It is possible to determine specifically surface carbon concentration on aluminum foils by using [TRL-SC analyzer](#). It has patented “Two Zone Furnace” design easily converting carbon into CO<sub>2</sub> for further measurement by an NDIR detector. The same feature also provides extended catalyst service life. Calculated value of CO<sub>2</sub> is converted into carbon concentration per area of the material.

### Principle of operation

Sample is inserted in the sample loading car and it automatically drives the samples into the furnace at 600 °C without any pretreatment. Combustion gases coming through the decomposition furnace go through the catalyst furnace at 500 °C to further oxidize any incomplete combustion

products to CO<sub>2</sub>. After conditioning of combustion products, CO<sub>2</sub> is analyzed by NDIR detector for calculation of carbon amount on the surface. 6 different aluminum foil samples were analyzed in this study.

**Table 1:** Analysis Parameters for Surface carbon

| Parameters                               | Surface Carbon (SC) |
|--|---------------------|
| <b>Decomposition furnace temperature</b> | 600 °C              |
| <b>Catalyst furnace temperature</b>      | 500 °C              |
| <b>Carrier gas</b>                       | Oxygen              |
| <b>Carrier gas pressure</b>              | 2 bar               |
| <b>Total Carrier gas flow</b>            | 100 mL/min          |
| <b>NDIR gas flow</b>                     | 100 mL/min          |

### Results

Surface carbon results, surface area and amount of carbon on the surface of the samples are represented in table 2.

Results of the samples 5 and 6, which are with the lubricant, consist of much higher amounts of carbon than the other samples.

The carbon contents of the sample 1, 2, 3 and 4, which are annealed, is very low relative to sample 5 and 6.

**Table 1:** Metal sheet samples analysis result

| <b>Sample</b> | <b>Sample Surface Area (m<sup>2</sup>)</b> | <b>Total Surface Carbon (mg/m<sup>2</sup>)</b> |
|---------------|--|--|
| <b>1</b>      | 0.0113                                     | 9.0  |
| <b>2</b>      | 0.0110                                     | 8.6  |
| <b>3</b>      | 0.0113                                     | 5.5  |
| <b>4</b>      | 0.0427                                     | 1.0  |
| <b>5</b>      | 0.0034                                     | 723  |
| <b>6</b>      | 0.0088                                     | 330  |

### Conclusions

[TRL-SC](#) with its flexible configuration options for automation is proven to analyze surface carbon content of the aluminum samples which helps assuring quality control parameter production process of aluminum foil with regard to hygiene point. In this study, the results show that Trl-SC provides wide measurement ranges in the analysis of surface carbon amount from 1 mg/m<sup>2</sup> to 720 mg/m<sup>2</sup>.