



International Carbon Black Association

UN/DOT Transportation Testing - Flammability of Carbon Black HS Code 2803.00

The purpose of this document is to address transportation-related concerns and questions regarding the self-heating properties of carbon black.

For many years the International Carbon Black Association has regularly commissioned independent evaluations of the self-heating properties of carbon black produced by its member companies. These tests have been performed repetitiously on many samples representing a broad sample of commercially available carbon blacks. All these grades fall under HS code 2803.00.

The most recent self-heating test report was performed by Dekra Services (Princeton, NJ, USA.) Dekra evaluated the flammability/transport classification characteristics according to UN/DOT Transportation Testing N.4 (Division 4.2)/Self-Heating Solids.

The results of the testing are summarized below.

Sample	Self-Heating Substances – UN/DOT Test N.4 Division 4.2
HS Code 2803.00	NOT a self-heating substance of Division 4.2

The negative self-heating result confirms all past testing results: **HS 2803.00 is not self-heating.**

The full report from Dekra Services is attached with this document.

For additional information please contact the carbon black manufacturer.

Carbon Black Transportation Information

Carbon Black, CAS #1333-86-4, is a non-activated material of mineral origin. Carbon black is not a self-heating substance of Division 4.2 Packing Group assignments (Test method: U.N./TDG-DOT 49 CFR 173.25 Class 4 Div. 4.2 Packing Group Assignments).

- Carbon black is NOT activated carbon.
- Carbon black is NOT of animal nor vegetable origin.
- Carbon black is NOT made by a steam activation process.

Carbon Black is an engineered product which is manufactured under tightly controlled process conditions, resulting in specific, reproducible and consistent properties. The basic raw materials for the manufacture of carbon black are rich in hydrocarbons. By means of a thermal decomposition or a thermal-oxidative (partial) combustion process, the hydrocarbons are broken down to the constituent elements, namely carbon and hydrogen. The main raw materials are aromatic oils from coal tar or mineral oils, or natural gas.

Transportation Classifications

Commercial carbon black is not classified as a hazardous material by the following agencies:

- ◆ U.N. Recommendations on the Transport of Dangerous Goods
- ◆ European Agreement concerning the International Carriage of Dangerous Goods (ADR)
- ◆ Regulations concerning the International Carriage of Dangerous Goods by Rail (RID), part of the Convention concerning International Carriage by Rail
- ◆ European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN)
- ◆ International Convention for the Safety of Life at Sea — International Maritime Dangerous Goods Code (IMDG Code)
- ◆ Convention on International Civil Aviation — Annex 18 — Safe Transport of Dangerous Goods by Air (ICAO)
- ◆ Canadian Transport of Dangerous Goods Regulations
- ◆ International Air Transport Association (IATA-DGR)
- ◆ MARPOL 73/78, Annex II
- ◆ IBC-Code
- ◆ United States Department of Transportation
- ◆ Canadian Transport of Dangerous Goods Regulation
- ◆ Australian Dangerous Goods Code

The following refers to international transport identification and provides a statement in regards to the International Maritime Dangerous Goods Code (IMDG) as it relates to carbon black. According to special provision 925 under Chapter 3.3 “Special provisions applicable to certain substances, materials and articles”, the provisions of the Code do not apply for ***“non-activated carbon blacks of mineral origin”***.

ICBA2023-1/HS2803.00.00

Flammability of Solids-UN/DOT Transportation/Self-Heating Substances

Client	International Carbon Black Association (ICBA)
Client Location	701 Poydras Street, Suite 5000 New Orleans, LA 70139-5099
Contact	David Pavlich
Report Issue Date	04.18.23 (Revised: 6.16.23)
Report Number	CA30387RP_Rev.01



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1. PROJECT DETAILS AND TEST WORK APPROVAL STATEMENT

Quotation Number	DK22429729
Job Number	30387
DEKRA Facility	DEKRA Process Safety, 113 Campus Drive, Princeton, NJ 08540
Client Facility	International Carbon Black Association (ICBA) 701 Poydras Street, Suite 5000 New Orleans, LA 70139-5099
Contact Details	Phone: 609-799-4449 Email: process-safety-usa@dekra.com Web: www.dekra.us/process-safety
Report prepared by	R. Hammer
Reviewer	Victoria Goncalves, Laboratory Supervisor
Peer Reviewer	Yuan Dai, Senior Laboratory Specialist
Completion Date of Experimental Work	03.07.23

This report has been issued in digital format. All original test records are kept in a locked archive for a minimum of 10 years after the date of this report. In order to ensure that the integrity of the data is maintained, the signed hard copy (in the DEKRA archive) will be considered the source document and digital versions will be considered copies. Any remaining material(s) will be stored for a minimum of one month after the issue date of this report.

2. INTRODUCTION

This report contains test data for **ICBA** regarding flammability of solids/transport classification of sample: **ICBA2023-1/HS2803.00.00**. Specifically, the following work has been undertaken:

- UN/DOT Transportation Testing N.4 (Division 4.2) / Self-Heating Substances

This work is in response to quotation number **DK22429729**. A formal hazard assessment of the process / plant has not been conducted by DEKRA Process Safety and the consequences of specific process deviations have not been examined¹.

Detailed characterization of the material tested in this study is provided in Test Results of the report (with results summarized in the Summary of Test Results)².

¹ Process safety requires that all possible explosion, thermal stability and chemical reaction hazards are evaluated and that a suitable basis for safe operation is determined and implemented. Should the materials or processing conditions change then consideration should be given to re-assessment.

² A description of the test procedures together with full test results and information on their interpretation is given in the test sections of this report. The appendices provide background information on the subject matter. DEKRA Process Safety Laboratories are ISO 17025 or GLP (Good Laboratory Practice) compliant and this study was carried out to the principles of ISO 17025.

3. SUMMARY OF TEST RESULTS AND SAMPLE INFORMATION

3.1 Summary of Test Data for ICBA2023-1/HS2803.00.00

The results of testing completed on your sample, **ICBA2023-1/HS2803.00.00**, are summarized below.

<u>Flammability – UN/DOT Transportation</u>	<u>Test Results</u>
Self-Heating Substances – UN/DOT Test N.4 (Division 4.2)	This material is <u>NOT</u> a self-heating substance of Division 4.2

The results of testing are highly dependent on the composition and physical nature of the sample. In dust explosion testing, for example, the particle size distribution, moisture content, particle shape and preparation method can all markedly affect results. For this reason, any change in manufacturing / handling procedures or composition should be accompanied by a review of the relevant data.

DEKRA Process Safety would be pleased to provide specific advice, including interpretation and application of experimental data. Site visits to discuss operational safety or to perform plant inspections and measurements can be arranged on request.

3.2 Sample Information

<u>Parameter</u>	<u>Test Results</u>
DSI Reference Number:	30387
Company Name:	ICBA
Test Material:	ICBA2023-1/HS2803.00.00
Sample Origin:	PDMC warehouse vent hood
Appearance:	Coarse, black powder

3.3 Interpretation of Results

This guidance is based purely upon the data collected from the current study and therefore may not encompass all factors which are necessary in order to fully support your chosen Basis of Safety for processing the material. The test work should be supplemented with a detailed hazard and risk assessment (incorporating a hazardous area classification study), definition and implementation of a Basis of Safety and control measures, and continuing auditing to ensure that places where the material is processed remain safe. If further clarification, or support in any of these activities, is required, DEKRA Process Safety would be pleased to assist.

4. SELF-HEATING SUBSTANCES

Test Objective and Information

The series of tests is conducted to define whether a substance will undergo spontaneous ignition or dangerous self-heating. This is indicated by a sample temperature rise of 60 K (or more) above the set oven temperature. If the substance does exhibit self-heating properties, then further tests are conducted to determine the transportation classification and appropriate packing group. The test is conducted in accordance with the UN Transportation of Dangerous Goods Recommendations, Test N.4

The cubic sample containers of 25 mm and 100 mm side lengths are employed. They are open at the top and manufactured from stainless-steel net, with a mesh opening of 0.053 mm. Each container is housed in an outer cubic container cover, manufactured from stainless-steel net with a mesh opening of 0.595 mm which is slightly larger than the sample container, so that the container fits in this cover. In order to minimize the effects of air circulation, another stainless-steel cage, manufactured with a mesh opening of 0.595 and 150 x 150 x 250 mm in size, houses both these baskets.

The test material, in its commercial form, is filled to the brim of the sample basket which is then tapped several times. If the sample has been seen to settle then more material is added. The container is housed in the covers and placed in the center of the oven at the required test temperature

A hot air, circulating type oven with an inner capacity of approximately 120 liters and capable of controlling the internal temperature at $140 \pm 2^{\circ}\text{C}$ is utilized. In the initial test (with a 100 mm cube), the oven temperature is raised to 140°C and held isothermally for a test period of 24 hours. The temperature of the sample and oven are continually monitored / recorded with inconel sheathed thermocouples to provide accurate temperature measurement. One thermocouple is placed in the center of the sample and the other between the sample container and the oven wall.

Generic equipment information is contained in the table below.

Equipment Configuration / Settings for UN 4.2 Testing

Parameter	Setting / Configuration
Oven Type	Fan Assisted
Oven Volume	120 Liter (average)
Testing Range	$100^{\circ}\text{C} - 140^{\circ}\text{C}$
Thermocouple Type	K - Type
Data Acquisition system	DasyLab software
Test basket size	25mm^3 and 100mm^3 (With external $150 \times 150 \times 250\text{mm}$ wire cage)

Interpretation of results

A substance is classified as a self-heating substance of UN Class 4, Division 4.2 if a positive test result is observed in a 100 mm basket at 140°C. A positive result is defined as a sample temperature rise of 60°C (or more) above the oven temperature during a 24 hour period. From this point the following packing groups are then assigned to the sample:

Packing group II/GHS Category 1:

Assigned to any substance which gives a positive test result in a 25 mm basket at 140°C.

Packing group III/GHS Category 2:

Assigned to any substance which:

- a) gives a positive test result in a 100 mm basket at 140°C and a positive test result in a 100 mm basket at 100°C
- b) gives a positive test result in a 100 mm basket at 140°C and a negative test result in a 100 mm basket at 120°C and is to be transported in packages of more than 3 m³ volume
- c) gives a positive test result in a 100 mm basket at 140°C and a negative test result in a 100 mm basket at 100°C and is to be transported in packages of more than 450 l volume

Not Division 4.2:

Assigned to any substance which:

- a) gives a negative test result in a 100 mm basket at 140°C.
- b) gives a positive test result in a 100 mm basket at 140°C and a negative test result in a 100 mm basket at 120°C and is to be transported in packages of less than 3 m³ volume
- c) gives a positive test result in a 100 mm basket at 140°C and a negative test result in a 100 mm basket at 100°C and is to be transported in packages of less than 450 l volume

4.1 100mm at 140°C Test Results for ICBA2023-1/HS2803.00.00

Powder Information

Reference / Job#: **30387**
 Company Name: **ICBA**
 Test Material: **ICBA2023-1/HS2803.00.00**
 Sample Origin: **PDMC warehouse vent hood**
 Particle Size: **Tested as received**
 Appearance: **Coarse, black powder**

Test Information

Date: **03.07.23**
 Operator: **Y. Dai**
 Test Standard: **United Nations Document, Recommendations on the Transport of Dangerous Goods**
 UN Test Reference: **Test N.4**
 Apparatus: **Hot air circulation oven with an inner volume of >9 liters, Cubic stainless steel mesh containers**

Results

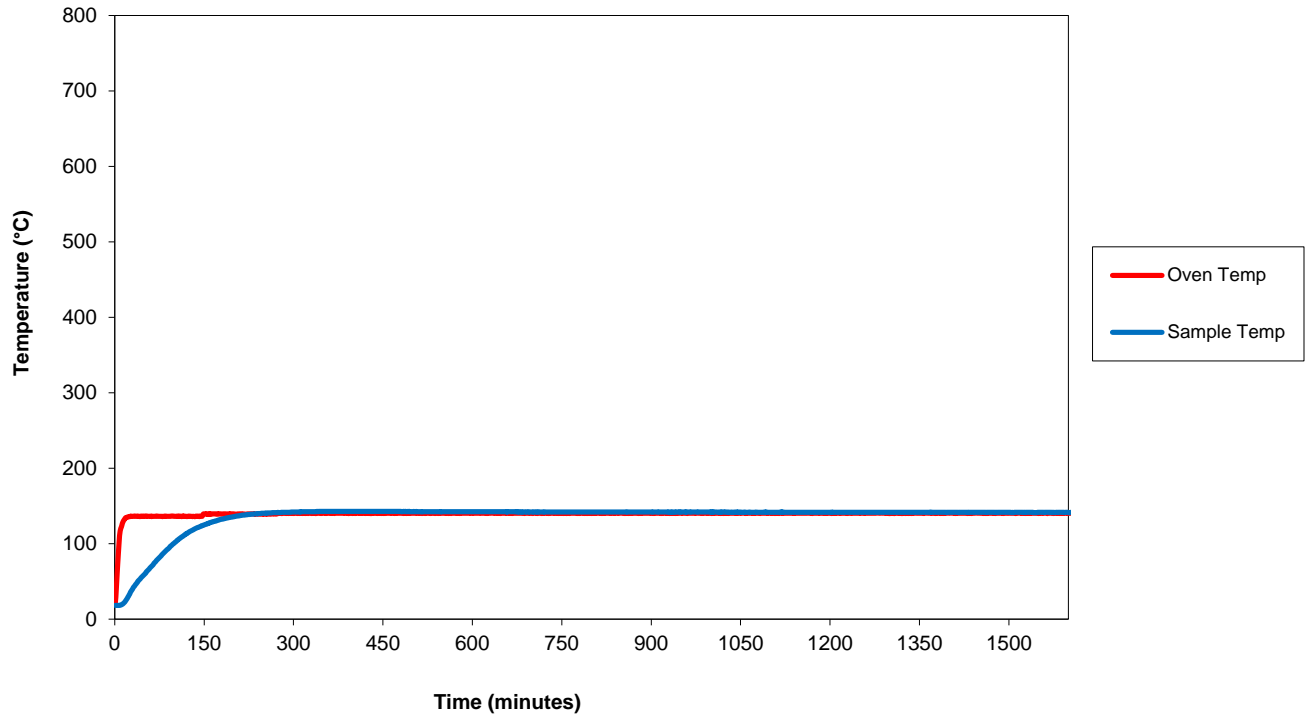
Not a Self-heating substance of Division 4.2.

Table 4.1.1: Details of Test

Basket Number	Basket Size (mm³)	Test Temperature (°C)	Sample Mass (g)
1	100	140	361.2

Comments: No exothermic reaction was observed during the test.

100mm Basket Test - Isothermal at 140°C
ICBA - ICBA2023-1/HS2803.00.00



5. APPENDIX

Disclaimer and Limitation of Liability

DEKRA performs services using generally accepted guidelines, standards, and practices which are considered reliable within our industry and which assume the accuracy of information/data provided by you, our "Client." Client is free to use, interpret or apply (or to not use, interpret or apply) the content of this report as it determines appropriate to its business. DEKRA is not responsible for Client's use, interpretation or application thereof.

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