

**EVALUATION TEST REPORT**  
**CBDO-23-06**  
**CATALYTIC CARBON BRAKE DISK OXIDATION TEST**

**For SAE AMS1431/1435**  
**Runway Deicing/Anti-Icing Product**

**D-Ice NF**  
**Lot # NF-23-1**  
**Produced at Croatia**

**for**  
**NORDIX CHEMICALS FACTORY d.o.o.**  
**Radnicka cesta 173L, Zagreb**  
**10000**  
**Croatia**

**by**

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## 1. INTRODUCTION

This report presents results of Catalytic Carbon Brake Disk Oxidation test, performed on a sample of **D-Ice NF Runway Deicing/Anti-Icing Product, Lot # NF-23-1** provided by **NORDIX CHEMICALS FACTORY d.o.o.** The anti-oxidant coated coupons used for performing the tests were in accordance with the SAE AIR5567A requirements, and were provided by Honeywell Aerospace, 3520 Westmoor Street, South Bend, IN 46628 USA.

The Catalytic Carbon Brake Disk Oxidation Test results, as per the AIR5567A Method, are reported for informational purpose only. The tests were performed at the Anti-icing Materials International Laboratory (AMIL), research laboratory which is located at the Université du Québec à Chicoutimi (UQAC). AMIL is independent of deicing chemical manufacturers and was found qualified on November 3, 2022 by the Performance Review Institute according to PRI document AC3002, “audit criteria for compliance to SAE AIR5567” of AMS1431 and AMS1435.

## 2. PROCEDURE

The Runway Deicing /Anti-Icing Product was tested in accordance with the **SAE AIR5567A[1] “Test Method for Catalytic Carbon Brake Disk Oxidation”** as per the latest revision of the SAE AMS1431 [2] and AMS1435 [3] specifications. This simple test method was designed to assess the relative effect of runway deicing chemicals on carbon brake systems by measuring the mass change of contaminated carbon brake anti-oxidant (AO) coated coupons when submitted to oxidation tests at high temperature according to the AIR5567A test method.

The carbon/carbon composite brake material CARBENIX® 4000 (C4000®) test coupons (\*section 3.1) are treated with a generic anti-oxidant coating (\*section 3.3) and then immersed in a runway deicer (25% w/w concentration) for 10 minutes. Deicer contaminated coupons are then dried at 150°C for 2 hours and transferred to a desiccator and cooled for a minimum of 30 minutes (\*section 3.4). After the cooling period, the test coupons are heated in a still air muffle furnace at 550°C for 24 hours. After the heating period, the coupons are cooled and the normalized oxidation weight loss is calculated by means of the % weight loss (\*section 3.5).

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\* Refer to AIR5567A

### 3. RESULTS

#### 3.1 Runway Deicing/Anti-Icing Product Identification

The Catalytic Carbon Brake Disk Oxidation Test was performed on the runway deicer described in Table 1.

**Table 1 - Runway Deicing/Anti-Icing Product Identification**

| Company                          | Runway Deicing/Anti-Icing Product |       |                 | AMIL Label | RI <sup>1</sup> (20°C) | Manuf. Date | Manuf. Location | Recep. Date |
|----------------------------------|-----------------------------------|-------|-----------------|------------|------------------------|-------------|-----------------|-------------|
|                                  | Name                              | Form  | Conc. % w/w     |            |                        |             |                 |             |
| NORDIX CHEMICALS FACTORY d.o.o.. | D-Ice NF Lot # NF-23-1            | Solid | 25 <sup>2</sup> | X849       | 1.3640                 | 23-10-06    | Croatia         | 23-11-16    |

#### 3.2 Test Results Summary

Table 2 presents the Catalytic Carbon Brake Oxidation test results. Figure 1 presents oxidation weight losses. The details of the test results are presented in Table 3 and the experimental data sheets are presented in Annexe A.

**Table 2 - Summary of Catalytic Carbon Brake Disk Oxidation Test Results**

| Company                        | Runway Deicing/Anti-Icing Product Name | Mean Oxidation Weight Loss (%) 3.5 (h) | Mean Normalized Weight Loss (%) 3.5 (k) |
|--------------------------------|----------------------------------------|----------------------------------------|-----------------------------------------|
| NORDIX CHEMICALS FACTORY d.o.o | D-Ice NF Lot # NF-23-1                 | 32.4 ± 2.4                             | 34.4 ± 2.2                              |
| Honeywell Aerospace            | Control Coupon                         | 0.4 ± 0.1                              | n.a                                     |

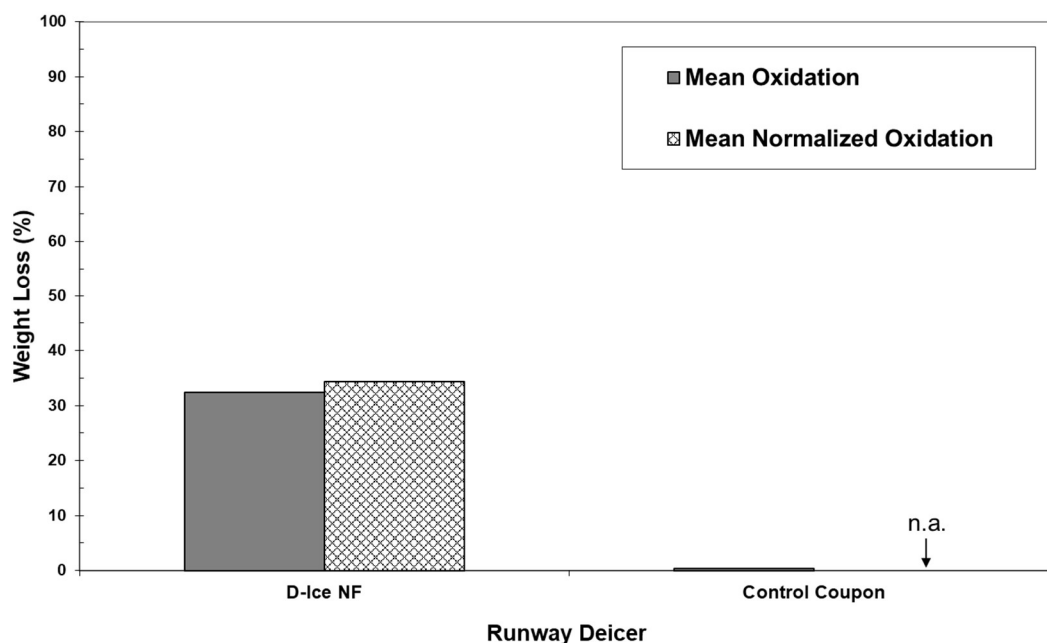
**The Runway Deicing/Anti-Icing Product NORDIX CHEMICALS FACTORY d.o.o., D-ICE NF, Lot # NF-23-1 was tested in November 2023, in accordance with paragraph 3.2.13 of AMS1435D as per Catalytic Carbon Brake Disk Oxidation Test (AIR5567A).**

<sup>1</sup> Refractive Index

<sup>2</sup> 25% w/w (active ingredient); refer to AIR5567-Rev A, section 3.4



**CATALYTIC CARBON BRAKE DISK OXIDATION TEST**  
**550°C, 24 hours**



**Figure 1 - Mean Weight Loss (%)**

**Table 3 - Oxidation Test Result - Runway Deicing/Anti-Icing Product**  
**D-ICE NF, Lot # NF-23-1**

| Test Parameters                                                                     |           | AIR5567<br>Section<br>ref. | Results     |
|-------------------------------------------------------------------------------------|-----------|----------------------------|-------------|
| Deicer Concentration                                                                |           | -                          | 25% w/w     |
| Mean pick up of deicer in coupon (%)                                                |           | 3.4 (j)                    | 1.32        |
| Mean pick up of AO in coupons (%)                                                   |           | 3.3 (k)                    | 1.42        |
| Mean ratio deicer pick up (%) / AO pick up (%)                                      |           | 3.5 (i)                    | 0.94        |
| Furnace temperature (oxidation test)                                                | Min (°C)  | -                          | 549.7       |
|                                                                                     | Max (°C)  | -                          | 550.1       |
|                                                                                     | Mean (°C) | -                          | 549.8 ± 0.1 |
| Oxidation test time (minutes)                                                       |           | -                          | 1440        |
| Mean oxidation weight loss deicer contaminated coupons (%)                          |           | 3.5 (h)                    | 32.4        |
| Standard deviation oxidation weight loss deicer contaminated coupons (%)            |           | 3.5 (h)                    | 2.4         |
| Mean normalized weight loss deicer contaminated coupons (%)                         |           | 3.5 (k)                    | 34.4        |
| Standard deviation normalized oxidation weight loss deicer contaminated coupons (%) |           | 3.5 (k)                    | 2.2         |

**Table 4 - Oxidation Test Result - Control Coupons**

| Test Parameters                                    |           | AIR5567<br>Section<br>ref. | Results     |
|----------------------------------------------------|-----------|----------------------------|-------------|
| Mean pick up of AO in coupons (%)                  |           | 3.3 (k)                    | 1.60        |
| Furnace temperature (oxidation test)               | Min (°C)  | -                          | 550.0       |
|                                                    | Max (°C)  | -                          | 550.8       |
|                                                    | Mean (°C) | -                          | 550.3 ± 0.2 |
| Oxidation test time (minutes)                      |           | -                          | 1440        |
| Mean weight loss control coupons (%)               |           | 3.5 (h)                    | 0.4         |
| Standard deviation weight loss control coupons (%) |           | 3.5 (h)                    | 0.1         |

#### 4. REFERENCES

1. SAE International Aerospace Information Report, "Test Method for Catalytic Carbon Brake Disk Oxidation", AIR5567, revision A, June 2010.
2. SAE International Aerospace Material Specification, "Solid Runway Deicing/Anti-Icing Product", AMS 1431, revision E, October 2018.
3. SAE International Aerospace Material Specification, "Liquid Runway Deicing/Anti-Icing Product", AMS 1435, revision D, November 2018.

# **ANNEXE A**

## **TEST DATA SHEETS**

### **Oxidation Test Results**

|                                      |      |
|--------------------------------------|------|
| D-Ice NF, Lot # NF-23-1 (X849) ..... | p. 6 |
| Control Coupon .....                 | p. 6 |

| REPORT #: CBDO-23-06  |          |                                |                                                          | FURNACE TEMP (°C): 549.7 min |                                        |               |                           | TEST DATE: 2023-11-29         |                       |                                    |                                        |
|-----------------------|----------|--------------------------------|----------------------------------------------------------|------------------------------|----------------------------------------|---------------|---------------------------|-------------------------------|-----------------------|------------------------------------|----------------------------------------|
| DEICER NAME: D-Ice NF |          |                                |                                                          | 550.1 max                    |                                        |               |                           | GROUP COUPON #: 244           |                       |                                    |                                        |
|                       |          |                                |                                                          | 549.8 ± 0.1 mean ± std. dev. |                                        |               |                           |                               |                       |                                    |                                        |
| Initial Weights (g)   |          |                                |                                                          | Contamination (g)            |                                        |               |                           | Oxidation (g)                 | Results               |                                    |                                        |
| FLUID AMIL #          | Coupon # | Bare Coupon Initial Weight (a) | AO Coated Coupon Initial Weight (b) After 2 hours drying | 3.3 k % Weight AO Pick Up    | Contaminated Coupon Initial Weight (c) | Weight Change | 3.4 j % Weight DI Pick Up | 24 h @ 550°C Final Weight (d) | 3.5 h % Weight Change | 3.5 i Ratio DI Pick Up/ AO Pick Up | 3.5 k Normalized Oxidation Weight Loss |
| X849                  | B004     | 19.994                         | 20.266                                                   | 1.360                        | 20.517                                 | 0.251         | 1.255                     | 14.194                        | 30.369                | 0.923                              | 32.910                                 |
|                       | B044     | 19.691                         | 19.962                                                   | 1.376                        | 20.231                                 | 0.269         | 1.366                     | 12.802                        | 36.362                | 0.993                              | 36.632                                 |
|                       | B053     | 20.054                         | 20.310                                                   | 1.277                        | 20.529                                 | 0.219         | 1.092                     | 14.511                        | 28.917                | 0.855                              | 33.802                                 |
|                       | B061     | 19.923                         | 20.190                                                   | 1.340                        | 20.429                                 | 0.239         | 1.200                     | 14.235                        | 29.890                | 0.895                              | 33.392                                 |
|                       | B069     | 19.887                         | 20.170                                                   | 1.423                        | 20.461                                 | 0.291         | 1.463                     | 13.731                        | 32.378                | 1.028                              | 31.488                                 |
|                       | B076     | 19.687                         | 19.984                                                   | 1.509                        | 20.268                                 | 0.284         | 1.443                     | 13.147                        | 34.729                | 0.956                              | 36.318                                 |
|                       | B082     | 19.613                         | 19.907                                                   | 1.499                        | 20.164                                 | 0.257         | 1.310                     | 13.585                        | 32.234                | 0.874                              | 36.874                                 |
|                       | B130     | 19.666                         | 19.976                                                   | 1.576                        | 20.263                                 | 0.287         | 1.459                     | 13.935                        | 30.718                | 0.926                              | 33.180                                 |
| AVERAGE               |          |                                |                                                          | 1.420                        |                                        | 0.262         | 1.324                     |                               | 32.383                | 0.942                              | 34.399                                 |
| STD DEV               |          |                                |                                                          | 0.101                        |                                        | 0.025         | 0.135                     |                               | 2.394                 | 0.054                              | 2.160                                  |

| DEICER NAME: N.A.  |          |                                |                                     | FURNACE TEMP (°C): 550.0 min |                                        |               |                           | TEST DATE: 2015-02-05         |                       |                                    |                                        |
|--------------------|----------|--------------------------------|-------------------------------------|------------------------------|----------------------------------------|---------------|---------------------------|-------------------------------|-----------------------|------------------------------------|----------------------------------------|
|                    |          |                                |                                     | 550.8 max                    |                                        |               |                           |                               |                       |                                    |                                        |
|                    |          |                                |                                     | 550.3 ± 0.2 mean ± std. dev. |                                        |               |                           |                               |                       |                                    |                                        |
| Initial Weight (g) |          |                                |                                     | Contamination (g)            |                                        |               |                           | Oxidation (g)                 | Results               |                                    |                                        |
| Reference          | Coupon # | Bare Coupon Initial Weight (a) | AO Coated Coupon Initial Weight (b) | 3.3 k % Weight AO Pick Up    | Contaminated Coupon Initial Weight (c) | Weight Change | 3.4 j % Weight DI Pick Up | 24 h @ 550°C Final Weight (d) | 3.5 h % Weight Change | 3.5 i Ratio DI Pick Up/ AO Pick Up | 3.5 k Normalized Oxidation Weight Loss |
| Control Coupon     | 1094     | 19.716                         | 20.088                              | 1.887                        | n/a                                    | n/a           | n/a                       | 20.027                        | 0.309                 | n/a                                | n/a                                    |
|                    | 1233     | 19.581                         | 19.975                              | 2.012                        | n/a                                    | n/a           | n/a                       | 19.881                        | 0.480                 | n/a                                | n/a                                    |
|                    | 1161     | 19.584                         | 19.902                              | 1.624                        | n/a                                    | n/a           | n/a                       | 19.846                        | 0.286                 | n/a                                | n/a                                    |
|                    | 1241     | 19.899                         | 20.185                              | 1.437                        | n/a                                    | n/a           | n/a                       | 20.135                        | 0.251                 | n/a                                | n/a                                    |
|                    | 1243     | 19.890                         | 20.153                              | 1.322                        | n/a                                    | n/a           | n/a                       | 20.061                        | 0.463                 | n/a                                | n/a                                    |
|                    | 1245     | 19.976                         | 20.245                              | 1.347                        | n/a                                    | n/a           | n/a                       | 20.168                        | 0.385                 | n/a                                | n/a                                    |
|                    | 1226     | 20.088                         | 20.378                              | 1.444                        | n/a                                    | n/a           | n/a                       | 20.319                        | 0.294                 | n/a                                | n/a                                    |
|                    | 1235     | 19.714                         | 20.050                              | 1.704                        | n/a                                    | n/a           | n/a                       | 19.979                        | 0.360                 | n/a                                | n/a                                    |
| AVERAGE            |          |                                |                                     | 1.597                        |                                        |               |                           |                               | 0.354                 |                                    |                                        |
| STD DEV            |          |                                |                                     | 0.255                        |                                        |               |                           |                               | 0.084                 |                                    |                                        |

## **ACCREDITATION**



*In accordance with PRI AC3002, Audit Criteria for Compliance to SAE AIR5567:*

## *Anti-Icing Materials International Laboratory (AMIL)*

*Universite du Quebec a Chicoutimi  
Department des Sciences Appliquees  
555, Boulevard de l'Universite  
Chicoutimi Quebec, Canada G7H 2B1*

Has had its facilities examined and approved through continuing audit procedures as established by PRI for conformance to the applicable specification requirements for the Runway Deicing Product Catalytic Carbon Brake Disk Oxidation acceptance test facilities.

This certificate is granted by authority of the Performance Review Institute for:

## *Testing of Deicing/Anti-Icing Fluids*

Certificate Number: 0002-A  
Expiration Date: 31 October 2027  
Issue Date: 03 November 2022

**Jay Solomond**  
Executive Vice President & Chief Operating Officer

Performance Review Institute (PRI) | 161 Thorn Hill Road | Warrendale, PA 15086-7527