

Bellaterra: 7<sup>th</sup> November, 2019

File number: **19/21107-2270**

Petitioner's reference: **NEDEX KIMYA SAN VE TIC, A.S.**  
Aracı Sokak No 8  
34774 ÜMRANIYE  
ISTANBUL - TURKEY

## TEST REPORT

Date at which the sample was received: 2019-07-22

Date testing performed: 2019-07-22 to 2019-11-06

### RECEIVED MATERIAL

A desiccant in bulk, packed in vacuum bags, was received from the petitioner and with the following indications:

Type	Size (mm)	Trademark	Sample number
NANOMOL	0,5 – 0,9	NEDEX	2270

Note: It is added the last column to introduce the sample identification number according to the laboratory.

**REQUESTED TESTS**

Determination of the characteristics of the desiccant in bulk according to the following tests:

1. Granulometry
2. Density
3. Gas desorption
5. AWAC
6. LOI at 540°C
7. Tc Characterization

**RESULTS**

**1. DETERMINATION OF PARTICLE SIZE DISTRIBUTION (sieving method)  
(Internal procedure)**

Determination of the desiccant size distribution (internal procedure)

**Test method**

Dry sieving.  
The sample tests once his weight becomes stable to the environmental conditions of the laboratory.

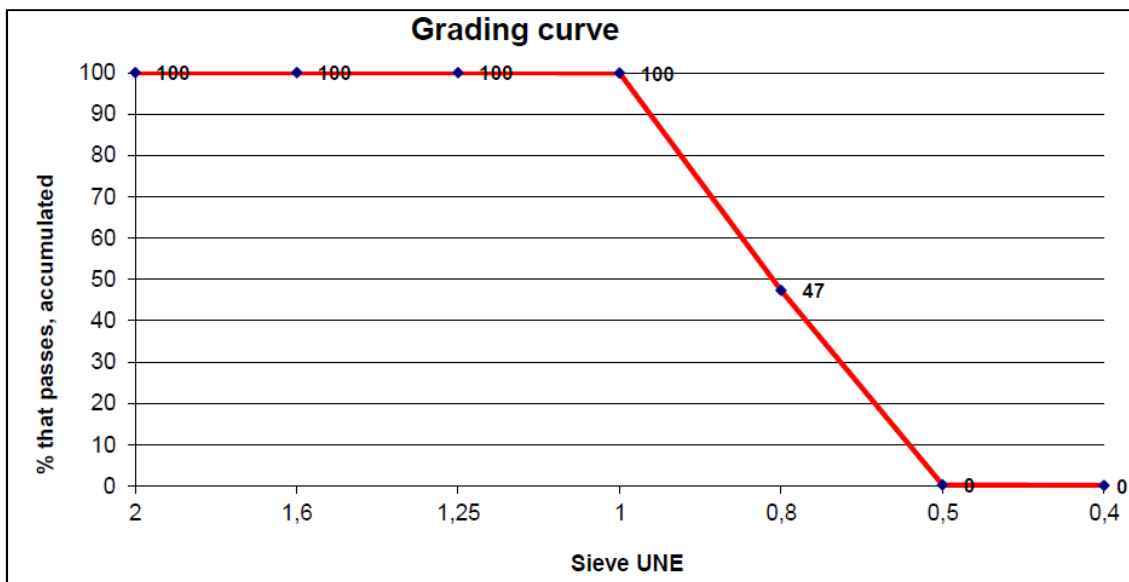
**Test results**

Environmental conditions: 20.4°C and 47.3% RH.

For the performing of the test, the following sieves indicated by the petitioner were used:

Sieve (mm)	% retained by the sieve	% that passes. accumulated
2.00	0	100
1.60	0	100
1.25	0	100
1.00	0	100
0.80	53	47
0.50	47	0
0.40	1	0

Percentage of material that passes through the sieve 0.4 mm 0.1



## 2. DETERMINATION OF APPARENT DENSITY (Internal procedure)

For the accomplishment of this test the basic directives of the standard UNE-EN 1097-3 were followed.

The test is realized after the bag opens, closed hermetically, that was containing the desiccator.

### Test results

Environmental conditions: 26.0°C and 52% RH.

Sample	Mass container, kg	Mass container + sample, kg	Container volume, l	Apparent density, pb (mg/m <sup>3</sup> )
1	0.09038	0.39996	0.34172	0.906
2	0.09038	0.40078	0.34172	0.906
3	0.09038	0.40061	0.34172	0.906

**Apparent density  
(average)**

**0.907 mg/m<sup>3</sup>**

### 3. GAS DESORPTION

Determination of the gas desorption based on Annex E of the standard EN 1279-4:2018 "*Glass in Building - Insulating Glass Units - Part 4: Methods of test for the physical attributes of edge seal components and inserts.*"

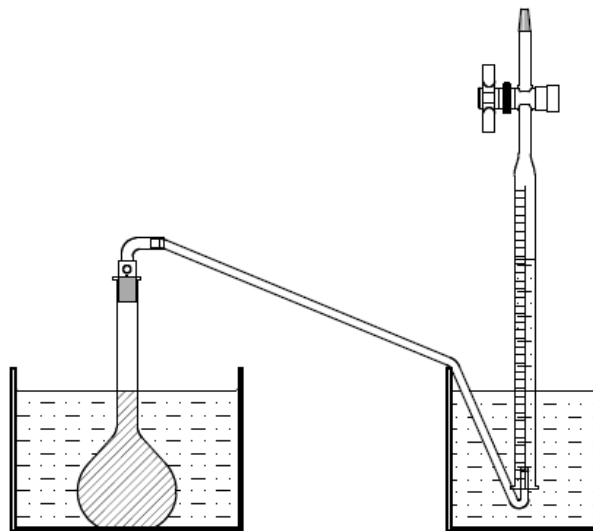
According to section 6.3.3 of the standard, the criteria of the desiccant supplied to the IGU manufacturer shall have a gas desorption less than 0.3 ml/g.

#### **Procedure**

Measure the volume of gas desorbed by a desiccant whose equilibrium temperature is increased from 20°C to 70°C.

The laboratory carried out the test based on the Annex E, section E.4 of the standard EN 1279-4:2018, using a burette of 500 ml.

Assembly:



**Figure E.1 — Gas desorption apparatus**

The volume of desorbed gas,  $V_{gas}$ , per weight of molecular sieve,  $W$ , shall be calculated and expressed in ml/g:

$$V_{gas} = \frac{100 - V_{H_2O}}{W}$$

Where:

100= Total volume of burette (ml);

W= Weight of molecular sieve in a 250 ml flask (g);

$V_{H_2O}$  = Volume of water in burette for the last reading (ml).

### **Test results**

Environmental conditions: 22.1°C and 49% HR.

<b>W (g)</b>	<b>239.3</b>
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Time	$V_{H_2O}$ (ml)	Change of Measure (ml)
0 (at 20°C)	100	0
1 h	99.5	0.5
1 h y 30 min	99.4	0

<b>Gas desorption</b>	<b>0.003 ml/g</b>
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#### **4. AWAC**

The available water adsorption capacity (AWAC) is expressed as the percentage of weight increase in relation to the original weight of the desiccant sample.

#### **Procedure**

According to Annex E, section E.2 of the standard EN 1279-4:2018, three samples shall be tested.

Then these shall be placed in a desiccator with a stable relative humidity by means a saturated solution of potassium hydroxide (KOH) in water at (23±3)°C during 72 h.

Calculate available water adsorption capacity AWAC express the result in % by weight:

$$AWAC = \frac{W_2 - W_1}{W_1 - W_0} \cdot 100$$

Where:

$W_0$  = The weight of dry glass dish and lid (g);

$W_1$  = The weight of dish and lid and desiccant before water exposure (g);

$W_2$  = The weight of dish and lid and desiccant after water adsorption (g).

<b>Samples</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b><math>W_0</math> (g)</b>	71.663	124.444	60.394
<b><math>W_1</math> (g)</b>	72.696	125.480	61.404
<b><math>W_2</math> (g)</b>	72.863	125.652	61.581
<b>AWAC</b>	<b>16.2%</b>	<b>16.6 %</b>	<b>17.5 %</b>

<b>AWAC Average</b>	<b>16.8%</b>
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## 5. LOI at 540°C

Loss on ignition (LOI) is the loss of weight of a desiccant sample under exposure to 540 °C. The value reflects the reversible evaporated amount of water. The value shall be given in % weight loss per residual weight.

### **Procedure**

According to Annex E, section E.1 of the standard EN 1279-4:2018, three samples shall be tested.

The crucibles place in the preheated furnace at (540±10)°C for at least 2 h.

Calculate the loss on ignition (LOI) express the result in % by weight.

$$LOI = \frac{W_2 - W_1}{W_1 - W_0} \cdot 100$$

Where:

$W_0$  = The weight of empty crucible (g);

$W_1$  = The weight of crucible plus sample after exposure at 540 °C (g);

$W_2$  = The initial weight of crucible plus sample (g).

**Test results**

Environmental conditions: 21.6°C and 53.1 HR.

<b>Samples</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>W<sub>0</sub> (g)</b>	66.284	79.903	69.391
<b>W<sub>2</sub> (g)</b>	93.033	106.118	96.422
<b>W<sub>1</sub> (g)</b>	93.034	106.117	96.420
<b>LOI</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>

<b>LOI Average</b>	<b>0.0%</b>
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## 6. Tc characterization

According to Annex E, section E.3 of the standard EN 1279-4:2018, the standard moisture adsorption capacity,  $T_c$ , is the sum of AWAC and LOI at 540 °C, expressed in % by weight.

$$T_c = AWAC + LOI$$

### Results

<b>Tc</b>	<b>16.8 %</b>
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Fire Laboratory Responsible  
LGAI Technological Center S.A. (APPLUS)

Responsible Technician of Thermal Tests  
LGAI Technological Center S.A. (APPLUS)

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The results refer exclusively to the samples tested at the time and under the conditions indicated.

**Applus+** guarantees that this task has been carried out in compliance with the requirements of our Quality and Sustainability System, and furthermore, that the contractual terms and legal regulations have been complied with.

In the framework of our improvement programme, we would appreciate any comments you may deem appropriate. These should be addressed to the manager who signs this document, or to the Quality Director of Applus+, at the following address: [satisfaccion.cliente@applus.com](mailto:satisfaccion.cliente@applus.com)

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