

**REPORT OF MIGRATION OF COMPOUNDS INCLUDE IN THE  
RD-140/2003 FROM PRODUCTS USED TO BE IN CONTACT  
WITH WATER FOR HUMAN CONSUMPTION**

**Report Code: 2848869**

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**Date: 04/06/19**

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## 1. INTRODUCTION AND GENERAL INFORMATION.

The company ACKSOL INGENIERIA Y APLICACION, S.L. has required a migration study of a liquid material used to be in contact with water intended for human consumption.

### LABORATORY DATA:

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### CLIENT DATA:

ACKSOL INGENIERIA Y APLICACION, S.L.

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**Spain**

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## 2. ELEMENTS OF STUDY DESCRIPTION.

**Material pieces.** The pieces consist in ceramics sheets covered with the product. The samples have been identified as 4801596 (Sample) and 4801597 (Blank).

**Application:** The material has been indicated to be used in products intended to be in contact with water for human consumption.

**Commercial mane and batch:** CONTROLL INNERSEAL PLUS

**Reception data in LABAQUA** 26/02/2019

**Manufactured:** ACKSOL INGENIERIA Y APLICACION, S.L.

**Samples remitted by:** ACKSOL INGENIERIA Y APLICACION, S.L.

**Samples prepared by:** ACKSOL INGENIERIA Y APLICACION, S.L.

**Assay pieces preparation:** The sample consist in ceramics sheets covered with the product. ACKSOL INGENIERIA Y APLICACION, S.L. applied the product on the sheets according with the manual instructions of the product (ANNEX III):

- Pieces characteristics and dimensions:

Dimensions:

$S = 0.5 \text{ dm}^2$  each piece Total pieces = 20

Volumen: 2 L

Ratio  $S/V = 5.0 \text{ dm}^{-1}$



**Figure 1.** Image of the test piece.

### 3. EXPERIMENTAL PROCEDURE.

The present study is based on UNE-EN ISO 12873-2: 2005 “*Influencia de los materiales sobre el agua destinada al consumo humano, Influencia de la migración. Parte 2: Método de ensayo de materiales aplicados in-situ, excepto los materiales metálicos y los materiales a base de cemento*”.

When the migration water was obtained, the water sample was analyzed, indicated in the Annex I, in order to calculate the *migration rate*.

According with the UNE-EN ISO 12873-2:2005 and with CEN/CENELEC regulations, all the European countries are required to reach the specifications indicated.

**Table 1. General information about the migration test:**

Parameter	Data
Total number of sheets	20 pieces
Final water volume	2 L
Disinfection process	Not appropriate for this test
Water assay characteristics	Chlorinated water containing chlorine (Cl <sub>2</sub> ) 1ppm
Water assay and temperature	Chlorinated water at 23±1°C for 72±1h
Test deviations	No deviations.
Incidences	No incidences
Static contact period	07/03/2019 (24±1h) 10:00h
Star data:	08/03/2019 (72±1h) 10:30h
Final data:	11/03/2019 10:45h

**Reagents used:**

- Tap water from the laboratory.
- Assay water, chlorated water with a total chlorine content of 1ppm (Cl<sub>2</sub>).
- Chronometer ID Plan 1873, ID Calibration 25126. (Laboratory code G-154)
- Bath of water ID Calibración 42667. Laboratory code (B-131)

**Migration steps:**

- Sampling, shipment and preservation. The sample was provided by the company ACKSOL INGENIERIA Y APLICACION, S.L. No special preservation condition was required.
- Sample preparation. The client covered the ceramics sheets. According with UNE-EN ISO 12873-2: 2005 only the surface in contact with the water must be into consideration for the migration. One sheet face was covered with the product.
- Pieces treatment. The previous treatments consist on a washing step with a continuous water flow (rate between 1 to 3 m/min) during 60±5 minutes.
- Static contact period. The sheets were complete immersed in one (1) liter of water during 24±1 hours. No disinfection process has been required.
- Migration assay. The sheets were immersed in 2L of Chlorinated water at 1ppm at 23±1°C for 72±1h. At the same time, a blank with ceramics sheets without the product, have been also carried out in the same conditions than the samples.
- Analysis. The final concentration of the organic compounds was determined by means of the analytical methods indicated in the Annex I.

## 4. RESULTS.

### Sample codification.

The Table 2 show the number of each analysis reports.

**Table 2.** Sample denomination.

Analysis date	Code	Sample name	Total migration period (hours)
11/03/2019	4801596	MUESTRA	72±1
11/03/2019	4801597	BLANCO	72±1

### Analytical results:

Annex I of the final report with analytical results is. Likewise in Annex II the results of the Organic Compounds Analysis. In Annex III there is some information about the product given by the client.

In the next Table the analytical results are showed.

**4801596 (MUESTRA)**

Acrylamide	< 0.05	µg/L
Aldrin	< 0.01	µg/L
Aluminum	<b>4</b>	<b>µg/L</b>
Ammonium	< 0.10	mg/L
Antimony	< 2	µg/L
<b>Arsenic</b>	<b>13</b>	<b>µg/L</b>
<b>Barium</b>	<b>6</b>	<b>µg/L</b>
<b>Screening of organic compounds BS EN 15768</b>	<b>Informe adjunto</b>	<b>--</b>
Benzo- (g, h, i) -perylene	< 0.01	µg/L
Benzo-a-pyrene	< 0.005	µg/L
Benzo-b-fluoranthene	< 0.01	µg/L
Benzo-k-fluoranthene	< 0.01	µg/L
Beryllium	< 2	µg/L
Bicarbonates	<b>4.2</b>	<b>µg/L</b>
<b>Boron</b>	<b>215</b>	<b>µg/L</b>
Bromatos	< 10	µg/L
Cadmium	< 1	µg/L
<b>Calcium</b>	<b>14.1</b>	<b>mg/L</b>
<b>Carbonates</b>	<b>8.0</b>	<b>mg/L</b>
<b>Total Organic Carbon (TOC)</b>	<b>2.1</b>	<b>mg/L</b>
Total cyanides	< 5	µg/L
<b>Combined residual chlorine</b>	<b>0.08</b>	<b>mg/L</b>
<b>Free residual chlorine</b>	<b>0.52</b>	<b>mg/L</b>
<b>Total residual chlorine</b>	<b>0.59</b>	<b>mg/L</b>
Vinyl chloride	< 0.1	µg/L
<b>Chlorides</b>	<b>7.1</b>	<b>mg/L</b>
Cobalt	< 2	µg/L
Copper	< 2	µg/L
Colour	< 1.0	mg/L Pt/Co
<b>Conductivity at 20°C</b>	<b>201</b>	<b>µS/cm</b>
<b>Chrome</b>	<b>11</b>	<b>µg/L</b>
Dieldrin	< 0.01	µg/L



Epichlorohydrin	< 0.10	µg/L
<b>Fluorides</b>	<b>0.39</b>	<b>mg/L</b>
Heptachlor	< 0.01	µg/L
Heptachlor epoxide	< 0.01	µg/L
Iron	< 10	µg/L
Indeno- (1,2,3-c, d,) - pyrene	< 0.01	µg/L
<b>Langelier Index</b>	<b>0.56</b>	<b>--</b>
Manganese	< 2	µg/L
Mercury	< 0.20	µg/L
Nickel	< 2	µg/L
Nitrates	<b>3.6</b>	<b>mg/L</b>
Nitrites	< 0.05	mg/L
<b>Odor at 23°C</b>	<b>1</b>	<b>Ind. de dil.</b>
<b>Oxidability</b>	<b>0.82</b>	<b>mg/ O<sub>2</sub> /L</b>
<b>pH</b>	<b>9.5</b>	<b>U. pH.</b>
Silver	< 2	µg/L
Lead	< 2	µg/L
Selenium	< 2	µg/L
<b>Sodium</b>	<b>6.3</b>	<b>mg/L</b>
<b>Sulfates</b>	<b>78.6</b>	<b>mg/L</b>
<b>Temperature</b>	<b>21.1</b>	<b>°C</b>
<b>Turbidity</b>	<b>0.25</b>	<b>UNF</b>
<b>Vanadium</b>	<b>39</b>	<b>µg/L</b>
<b>Zinc</b>	<b>2</b>	<b>µg/L</b>

**4801597 (BLANCO)**

Acrylamide	< 0.05	µg/L
Aldrin	< 0.01	µg/L
<b>Aluminum</b>	<b>107</b>	<b>µg/L</b>
Ammonium	< 0.10	mg/L
Antimony	< 2	µg/L
<b>Arsenic</b>	<b>4</b>	<b>µg/L</b>
<b>Barium</b>	<b>2</b>	<b>µg/L</b>
Screening of organic compounds BS EN 15768	<b>Informe adjunto</b>	--
Benzo- (g, h, i) -perylene	< 0.01	µg/L
Benzo-a-pyrene	< 0.005	µg/L
Benzo-b-fluoranthene	< 0.01	µg/L
Benzo-k-fluoranthene	< 0.01	µg/L
Beryllium	< 2	µg/L
<b>Bicarbonates</b>	<b>13.0</b>	<b>µg/L</b>
<b>Boron</b>	<b>65</b>	<b>µg/L</b>
Bromatos	< 10	µg/L
Cadmium	< 1	µg/L
<b>Calcium</b>	<b>4.9</b>	<b>mg/L</b>
Carbonates	< 2.0	mg/L
<b>Total Organic Carbon (TOC)</b>	<b>0.6</b>	<b>mg/L</b>
Total cyanides	< 5	µg/L
<b>Combined residual chlorine</b>	<b>0.09</b>	mg/L
<b>Free residual chlorine</b>	<b>0.75</b>	<b>mg/L</b>
<b>Total residual chlorine</b>	<b>0.84</b>	<b>mg/L</b>
Vinyl chloride	< 0.1	µg/L
<b>Chlorides</b>	<b>3.9</b>	<b>mg/L</b>
Cobalt	< 2	µg/L
Copper	< 2	µg/L
Colour	< 1.0	mg/L Pt/Co
<b>Conductivity at 20°C</b>	<b>145</b>	<b>µS/cm</b>
<b>Chrome</b>	<b>3</b>	<b>µg/L</b>
Dieldrin	< 0.01	µg/L
Epichlorohydrin	< 0.10	µg/L

<b>Fluorides</b>	<b>0.13</b>	<b>mg/L</b>
Heptachlor	< 0.01	µg/L
Heptachlor epoxide	< 0.01	µg/L
Iron	< 10	µg/L
Indeno- (1,2,3-c, d,) - pyrene	< 0.01	µg/L
<b>Langelier Index</b>	<b>0.13</b>	<b>--</b>
Manganese	< 2	µg/L
Mercury	< 0.20	µg/L
Nickel	< 2	µg/L
Nitrates	<b>3.5</b>	<b>mg/L</b>
Nitrites	< 0.05	mg/L
<b>Odor at 23°C</b>	<b>1</b>	<b>Ind. de dil.</b>
<b>Oxidability</b>	<b>1.00</b>	<b>mg/ O<sub>2</sub> /L</b>
<b>pH</b>	<b>9.7</b>	<b>U. pH.</b>
Silver	< 2	µg/L
Lead	< 2	µg/L
Selenium	< 2	µg/L
<b>Sodium</b>	<b>2.9</b>	<b>mg/L</b>
<b>Sulfates</b>	<b>17.0</b>	<b>mg/L</b>
<b>Temperature</b>	<b>21.0</b>	<b>°C</b>
Turbidity	< 0.20	UNF
<b>Vanadium</b>	<b>15</b>	<b>µg/L</b>
<b>Zinc</b>	<b>7</b>	<b>µg/L</b>

The migration rate ( $M$ ) was calculated with the next equation:

$$M = c_n / (S / V \cdot t) \text{ [mg dm}^{-2}\text{d}^{-1}\text{]}$$

where:

$M$  = Migration rate

$c_n$  = The concentration obtained (expressed as mg/L and calculated with  $(c_n = a_n - b_n)$  where  $a_n$  is the concentration obtained in the migration and  $b_n$  the concentration obtained in the blank).

$t$  = Migration period (**3 days**)

$S/V$  = rate surface / volume in  $\text{dm}^{-1}$  (**5.0 $\text{dm}^{-1}$** )

**Migration rate calculation:**

**Table 2.1. Results 4801596 to 23±1 °C.**

<b>COMPOUNDS ANALYZED INCLUDED IN THE REPORT (ANNEX I)</b>	<b>Concentration and migration rate</b>			
	$b_n^T$	$a_n^T$	$c_n^T$	$M_n^T$
Acrylamide	< 0,05 µg/L	< 0,05 µg/L	< 0,05 µg/L	< 3.33 × 10 <sup>-6</sup> mg/dm <sup>2</sup> día
Aldrin	< 0,01 µg/L	< 0,01 µg/L	< 0,01 µg/L	< 6.67 × 10 <sup>-7</sup> mg/dm <sup>2</sup> día
Aluminum	107 µg/L	4 µg/L	< 2 µg/L	< 1.33 × 10 <sup>-4</sup> mg/dm <sup>2</sup> día
Ammonium	< 0,10 mg/L	< 0,10 mg/L	< 0,10 mg/L	< 6.67 × 10 <sup>-3</sup> mg/dm <sup>2</sup> día
Antimony	< 2 µg/L	< 2 µg/L	< 2 µg/L	< 1.33 × 10 <sup>-4</sup> mg/dm <sup>2</sup> día
<b>Arsenic</b>	<b>4 µg/L</b>	<b>13 µg/L</b>	<b>9 µg/L</b>	<b>6.00 × 10<sup>-4</sup> mg/dm<sup>2</sup> día</b>
<b>Barium</b>	<b>2 µg/L</b>	<b>6 µg/L</b>	<b>4 µg/L</b>	<b>2.66 × 10<sup>-4</sup> mg/dm<sup>2</sup> día</b>
Benzo- (g, h, i) - perylene	< 0,01 µg/L	< 0,01 µg/L	< 0,01 µg/L	< 6.67 × 10 <sup>-7</sup> mg/dm <sup>2</sup> día
Benzo-a-pyrene	< 0,005 µg/L	< 0,005 µg/L	< 0,005 µg/L	< 3.33 × 10 <sup>-7</sup> mg/dm <sup>2</sup> día
Benzo-b-fluoranthene	< 0,01 µg/L	< 0,01 µg/L	< 0,01 µg/L	< 6.67 × 10 <sup>-7</sup> mg/dm <sup>2</sup> día
Benzo-k-fluoranthene	< 0,01 µg/L	< 0,01 µg/L	< 0,01 µg/L	< 6.67 × 10 <sup>-7</sup> mg/dm <sup>2</sup> día
Beryllium	< 2 µg/L	< 2 µg/L	< 2 µg/L	< 1.33 × 10 <sup>-4</sup> mg/dm <sup>2</sup> día
Bicarbonates	13,0 mg/L	4,2 mg/L	< 4,0 mg/L	< 2.66 × 10 <sup>-1</sup> mg/dm <sup>2</sup> día

<b>Boron</b>	<b>65 µg/L</b>	<b>215 µg/L</b>	<b>150 µg/L</b>	<b><math>1.00 \times 10^{-3}</math> mg/dm<sup>2</sup> día</b>
Bromate	< 10 µg/L	< 10 µg/L	< 10 µg/L	< $6.67 \times 10^{-4}$ mg/dm <sup>2</sup> día
Cadmium	< 1 µg/L	< 1 µg/L	< 1 µg/L	< $6.67 \times 10^{-5}$ mg/dm <sup>2</sup> día
<b>Calcium</b>	<b>4,9 mg/L</b>	<b>14,1 mg/L</b>	<b>9,2 mg/L</b>	<b><math>6.13 \times 10^{-1}</math> mg/dm<sup>2</sup> día</b>
<b>Carbonates</b>	<b>&lt; 2,0 mg/L</b>	<b>8,0 mg/L</b>	<b>8,0 mg/L</b>	<b><math>5.33 \times 10^{-1}</math> mg/dm<sup>2</sup> día</b>
<b>Total Organic Carbon (TOC)</b>	<b>0,6 mg/L</b>	<b>2,1 mg/L</b>	<b>1,5 mg/L</b>	<b><math>1.00 \times 10^{-1}</math> mg/dm<sup>2</sup> día</b>
Total cyanides	< 5 µg/L	< 5 µg/L	< 5 µg/L	< $3.33 \times 10^{-4}$ mg/dm <sup>2</sup> día
Vinyl chloride	< 0,1 µg/L	< 0,1 µg/L	< 0,1 µg/L	< $6.67 \times 10^{-5}$ mg/dm <sup>2</sup> día
<b>Chlorides</b>	<b>3,9 mg/L</b>	<b>7,1 mg/L</b>	<b>3,2 mg/L</b>	<b><math>2.13 \times 10^{-1}</math> mg/dm<sup>2</sup> día</b>
Cobalt	< 2 µg/L	< 2 µg/L	< 2 µg/L	< $1.33 \times 10^{-4}$ mg/dm <sup>2</sup> día
Copper	2 µg/L	< 2 µg/L	< 2 µg/L	< $1.33 \times 10^{-4}$ mg/dm <sup>2</sup> día
<b>Chrome</b>	<b>3 µg/L</b>	<b>11 µg/L</b>	<b>8 µg/L</b>	<b><math>5.33 \times 10^{-4}</math> mg/dm<sup>2</sup> día</b>
Dieldrin	< 0,01 µg/L	< 0,01 µg/L	< 0,01 µg/L	< $6.67 \times 10^{-7}$ mg/dm <sup>2</sup> día
Epichlorohydrin	< 0.10 µg/L	< 0.10 µg/L	< 0.10 µg/L	< $6.67 \times 10^{-6}$ mg/dm <sup>2</sup> día
<b>Fluorides</b>	<b>0,13 mg/L</b>	<b>0,39 mg/L</b>	<b>0,26 mg/L</b>	<b><math>1.73 \times 10^{-2}</math> mg/dm<sup>2</sup> día</b>
Heptachlor	< 0,01 µg/L	< 0,01 µg/L	< 0,01 µg/L	< $6.67 \times 10^{-7}$ mg/dm <sup>2</sup> día
Heptachlor epoxide	< 0,01 µg/L	< 0,01 µg/L	< 0,01 µg/L	< $6.67 \times 10^{-7}$ mg/dm <sup>2</sup> día
Iron	< 10 µg/L	< 10 µg/L	< 10 µg/L	< $6.67 \times 10^{-4}$ mg/dm <sup>2</sup> día

Indeno- (1,2,3-c, d) - pyrene	< 0,01 µg/L	< 0,01 µg/L	< 0,01 µg/L	< 6.67 ×10 <sup>-7</sup> mg/dm <sup>2</sup> día
Manganese	< 2 µg/L	< 2 µg/L	< 2 µg/L	< 1.33 ×10 <sup>-4</sup> mg/dm <sup>2</sup> día
Mercury	< 0,20 µg/L	< 0,20 µg/L	< 0,20 µg/L	< 1.33 ×10 <sup>-5</sup> mg/dm <sup>2</sup> día
Nickel	< 2 µg/L	< 2 µg/L	< 2 µg/L	< 1.33 ×10 <sup>-4</sup> mg/dm <sup>2</sup> día
Nitrates	< 0,5 mg/L	< 0,5 mg/L	< 0,5 mg/L	< 3.33 ×10 <sup>-2</sup> mg/dm <sup>2</sup> día
Nitrites	< 0,5 mg/L	< 0,5 mg/L	< 0,5 mg/L	< 3.33 ×10 <sup>-3</sup> mg/dm <sup>2</sup> día
Silver	< 2 µg/L	< 2 µg/L	< 2 µg/L	< 1.33 ×10 <sup>-4</sup> mg/dm <sup>2</sup> día
Lead	< 2 µg/L	< 2 µg/L	< 2 µg/L	< 1.33 ×10 <sup>-4</sup> mg/dm <sup>2</sup> día
Selenium	< 2 µg/L	< 2 µg/L	< 2 µg/L	< 1.33 ×10 <sup>-4</sup> mg/dm <sup>2</sup> día
<b>Sodium</b>	<b>2,9 mg/L</b>	<b>6,3 mg/L</b>	<b>3,4 mg/L</b>	<b>2.27 ×10<sup>-1</sup> mg/dm<sup>2</sup> día</b>
<b>Sulfates</b>	<b>17,0 mg/L</b>	<b>78,6 mg/L</b>	<b>61,6 mg/L</b>	<b>4.11 mg/dm<sup>2</sup> día</b>
<b>Vanadium</b>	<b>15 µg/L</b>	<b>39 µg/L</b>	<b>24 µg/L</b>	<b>1.6 ×10<sup>-3</sup> mg/dm<sup>2</sup> día</b>
Zinc	7 µg/L	2 µg/L	< 2 µg/L	< 1.33 ×10 <sup>-4</sup> mg/dm <sup>2</sup> día
<b>Screening of organic compounds</b>	<b>132,4 µg/L</b>	<b>252,3 µg/L</b>	<b>119,9 µg/L</b>	<b>7.99 ×10<sup>-3</sup> mg/dm<sup>2</sup> día</b>

## 5. CONCLUSIONS.

- The final liquid obtained in the migration process in the test water has been analyzed in order to determine some compounds included in RD-140/2003 and indicated in table 2.1 and calculated the migration rate.
- Different metals such as Aluminum, Arsenic, Barium, Boron, Calcium, Chrome, Sodium and Vanadium were detected. In these cases of Aluminum, Arsenic, Chrome and Sodium do not exceed the value set by the RD-140/2003 which establishes a maximum value of 200µg/L for Aluminum, 10µg/L for Arsenic, 50µg/L for Chrome and 200mg/L for Sodium. In the cases of Barium, Calcium and Vanadium there is not a maximum value set by the RD-140/2003.
- Different anions such as Chloride, Fluoride and Sulfate were detected. In these cases do not exceed the value set by the RD-140/2003 which establishes a maximum value of 250mg/L for Chloride and Sulfate, and 1.2mg/L for Fluoride.
- Bicarbonates, Carbonates and TOC were detected. In these cases, there is not a maximum value set by the RD-140/2003.
- In the Analysis of Organic Compounds (ANEX II), none of compounds detected concentration exceeds the LME legislated for specific substances.
- The product coded as 4801596 (CONTROLL INNERSEAL PLUS) meets all the criteria set out in RD 140/2003.

## **6. ANNEX**

**ANNEX I.** Analysis report for samples 2323323 (Samples) and 2323324(Blanks).

**ANNEX II.** Screening of organic compounds.

**ANNEX III.** Additional information of the product to be tested.