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centre d'estudis de la construcció i anàlisi de materials, slu

Customer:	SORTEM DELIVERY, S.L. B66103847
Work:	
Address:	

Work number:	C140060		C140327
File number:	**C10X5042**	Delivery note:	
Reference:			
Delivery date:	06/04/2010		
Test/s date/s:	06/04/2010	-	15/04/2010

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THE OBTAINED RESULTS CORRESPOND ONLY TO THE ANALYZED SAMPLE

Addressed to:

SORTEM DELIVERY, S.L.

Avda. Barcelona, 40 local
08222 - TERRASSA

CECAM Celrà, 19/02/2014

REPORT OF RESULTS

SAMPLE DESCRIPTION: 2 urns ecological, 1 bag of vegetal meal, 1 bag of natural pigment and fragments of mud.
SAMPLING: Delivered to the laboratory by the customer

Quantity	Code	Description of the essay
1	AO01	Essay no cataloged

TIME OF DISSOLUTION IN WATER

Photographs nº1: before initiating the essay

Photographs nº 2: once finalised the essay

After 20 minutes, the urn dissolves

Comments:	This report is a translation of the original report file number C10X5042

Chief Technical Officer

Robert Planas Feliu

Head of the Department

Adriana Peitaví Terrats

The uncertainty of the quantitative values is available if requested.

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REPORT OF RESULTS

CHARACTERIZATION OF THE COMPOSITION OF A CINERARY URN

Essay subcontracted to the Technical Services of Research of the University of Girona

Comments:	This report is a translation of the original report file number C10X5042

Chief Technical Officer

Robert Planas Feliu

Head of the Department

Adriana Peitaví Terrats

The uncertainty of the quantitative values is available if requested.

Place and date: **Girona, April 14, 2010**

File number: **CE-20100318-1**

Petitioner reference:

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MATERIAL RECEIVED

Sample(s):

A fragment of cinerary urn finished in sand and referenced as URNA. One sample, referenced as **M1 URNA**, which corresponds to a pulverized fragment of the finished cinerary urn.

Three samples that are constituents of the paste from which the urn is made:

M2 PIGMENT - pigment to be incorporated into the urn paste.
M3 MUD - mineral filler incorporated into the urn paste.
M4 SEMOLINA - filler of vegetable origin that incorporates the paste of the urn.

Date of receipt of samples: **March 02, 2010**

SUBJECT MATTER REQUESTED:

Determine the composition of samples.

TEST METHODS:

Powder X-Ray Diffraction (XRD) and qualitative phase analysis. Energy separation X-ray microanalysis (EDX), associated with Scanning Electron Microscopy (SEM).

Instrumentation:

- Bruker powder X-ray diffractometer model D8 Advance, with Bragg-Brentano Theta -2Theta geometry, reflection mode. Kalfa radiation of Copper (λ= Å).

Working power: 40KV, 40mA. A secondary graphite monochromator was used. Scanned from 6 to 60º 2Theta. Step width: 0.05º, step duration: 4 to 15 seconds.

- Zeiss DSM 960A Scanning Electron Microscope (SEM), (20x to 200000x) equipped with SE, BSE, CL and Energy Separation X-Ray (EDX) signal detectors.

- Oxford LINK ISIS L200B X-ray microanalysis associated with MEB.

Sample preparation:
For X-Ray Diffraction:
Samples **M1 URN** and **M2 PIGMENT** were deposited in the sample holder without any physical or chemical manipulation.
Grinding of samples **M3 MUD** and M4 **SEMOLINA** with a planetary ball mill before depositing them in the sample holder.
For Scanning Electron Microscopy and X-Ray Microanalysis:
A fragment of the pictorial layer is separated from the **URN** sample. It is mounted on the sample holder and coated with carbon.

RESULTS

- Attached are the four diffractograms obtained with the phase analysis of samples **M1 URN, M2 PIGMENT, M3 MUD** and **M4 SEMOLINA** (Figures 1 to 4, pages 4 to 7).
- Three scanning electron microscopy images of the paint layer extracted from the **URN** sample are attached; one image at low magnification (i**mage 1**, page 8) and two images of the areas analyzed by the EDX technique (**images 2 and 3**, page 9). Regarding the composition of the paint layer, it is mainly constituted by **Carbon** and **Oxygen** (46 to 47%). It also contains **Titanium** in a concentration of up to 5%. It also contains traces of **Aluminum** (0.3 to 0.4%), **Silicon** (0.28 to 0.4%), **Phosphorus** (0.17%) and **Calcium** (0.10%).

CONCLUSIONS

1. Sample **M1 URN** contains mainly **Quartz** (SiO_2).
   As secondary components it contains **Calcite** ($CaCO_3$), **Chlorite** $(Mg,Al)_6(Si,Al)_4O_{10}(OH)_8$ and **Mica Muscovite** $KAl_2(Si_3Al)O_{10}((OH)_2)$.

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As minority components it contains **Albite** Na(AlSi3O8) and **Sanidine** K0.5Na0.5(AlSi3O8).

2. The **M2 PIGMENT** sample contains mainly **Quartz** (SiO2). As minor components it contains **Muscovite Mica** KAl2(Si3Al)O10((OH)2), **Kaolinite** (Al2(Si2O5)(OH)4) and **Hematite** (Fe2O3). It may also contain traces of **Goethite** (Fe2O3-H2O).
   It is a mineral-based pigment, where the main pigmenting component is Hematite (Fe2O3)..
3. Sample **M3 MUD** contains mainly **Quartz** (SiO2). As secondary components it contains **Calcite** (CaCO3) **Chlorite** (Mg,Al)6(Si,Al)4O10(OH)8, **Mica Muscovite** KAl2(Si3Al)O10((OH)2) and **Albite** Na(AlSi3O8).
4. Sample **M4 SEMOLINA** does not contain sufficient crystalline charge to draw conclusions about its composition from the X-ray diffractogram.
   It is a grain semolina, free of mineral charges.
5. The paint layer of the **URN sample** consists mainly of **Carbon** and **Oxygen** (46 to 47%). It also contains **Titanium** in a concentration of up to 5%. It also contains traces of **Aluminum** (0.3 to 0.4%), **Silicon** (0.28 to 0.4%), **Phosphorus** (0.17%) and **Calcium** (0.10%).
   It is an organic base paint with **Titanium Dioxide** (TiO2), which acts as a white pigment. (TiO2), which acts as a white pigment. It also contains traces of other elements: **Aluminum, Silicon, Phosphorus** and **Calcium.**

OBSERVATIONS

It is likely that in the sample **M3 MUD** there is a mineral characteristic of clays that, due to its low concentration and small particle size, has not been identified. For this it would be necessary to carry out a second X-ray diffraction using the technique of "oriented aggregates".

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Figure 1. Diffractogram with phase analysis of the sample. **M1 URN**

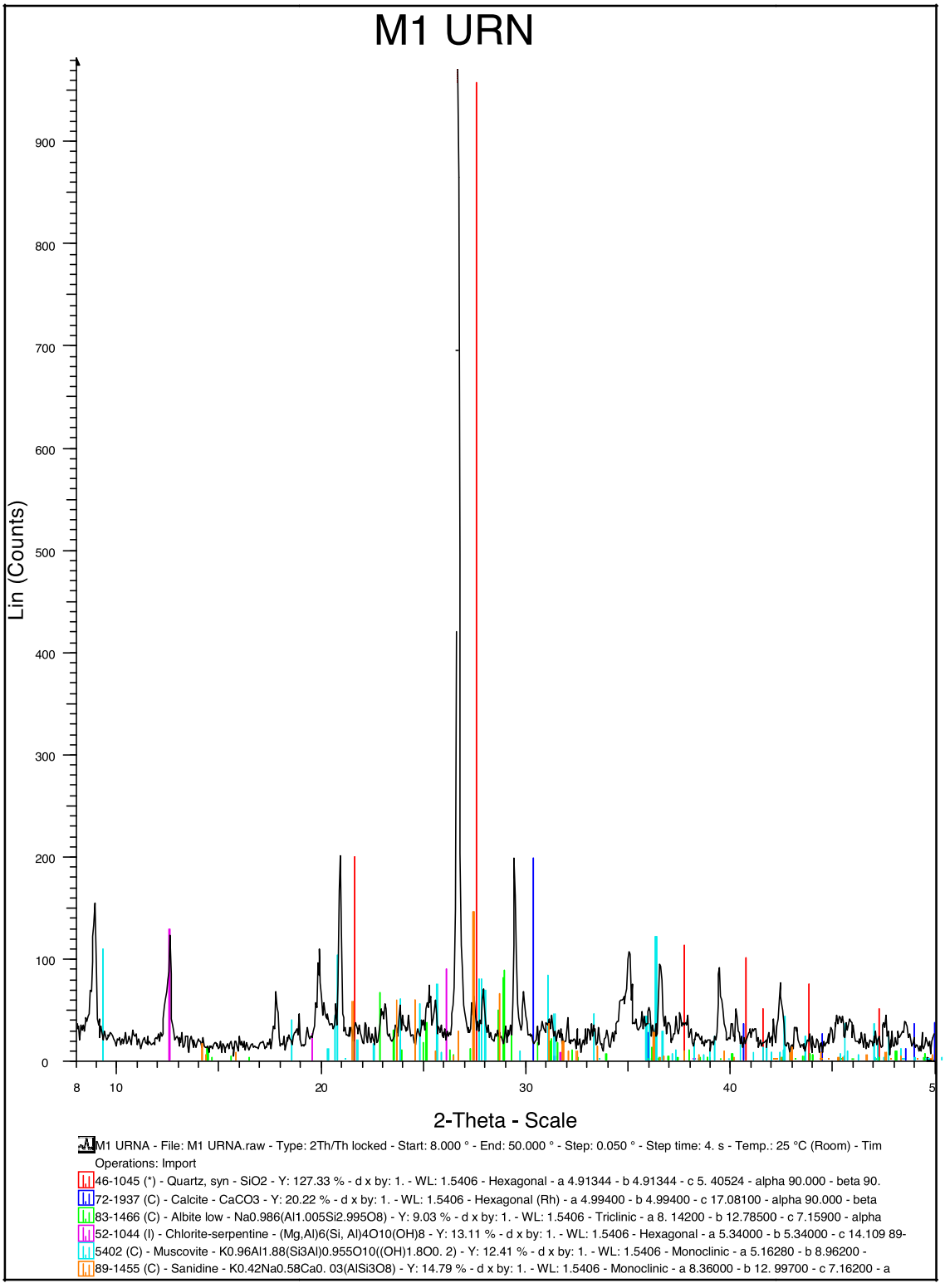

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Figure 2. Diffractogram with phase analysis of the sample. **M2 PIGMENT**

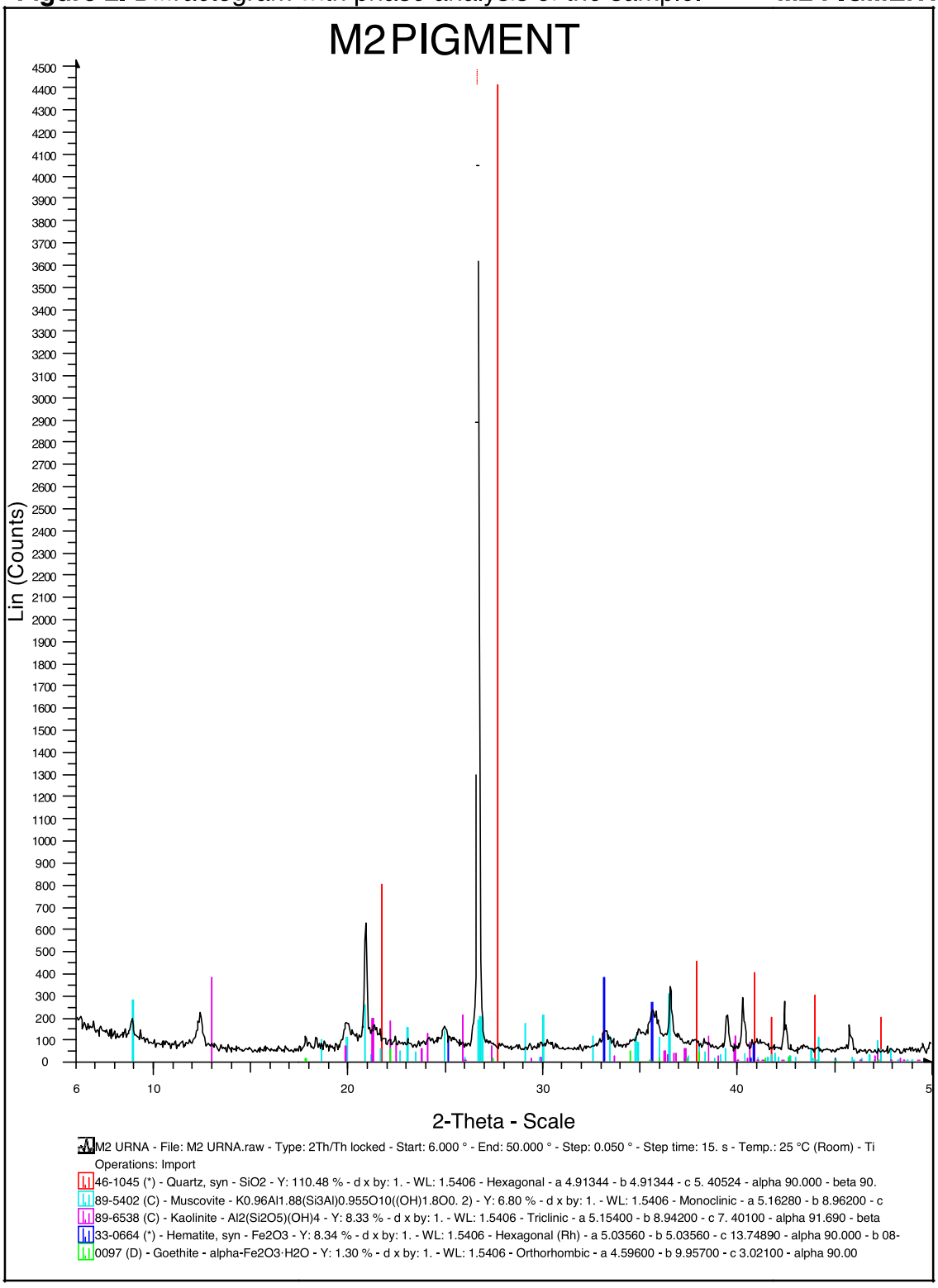

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Figure 3. Diffractogram with phase analysis of the sample. **M3 MUD**

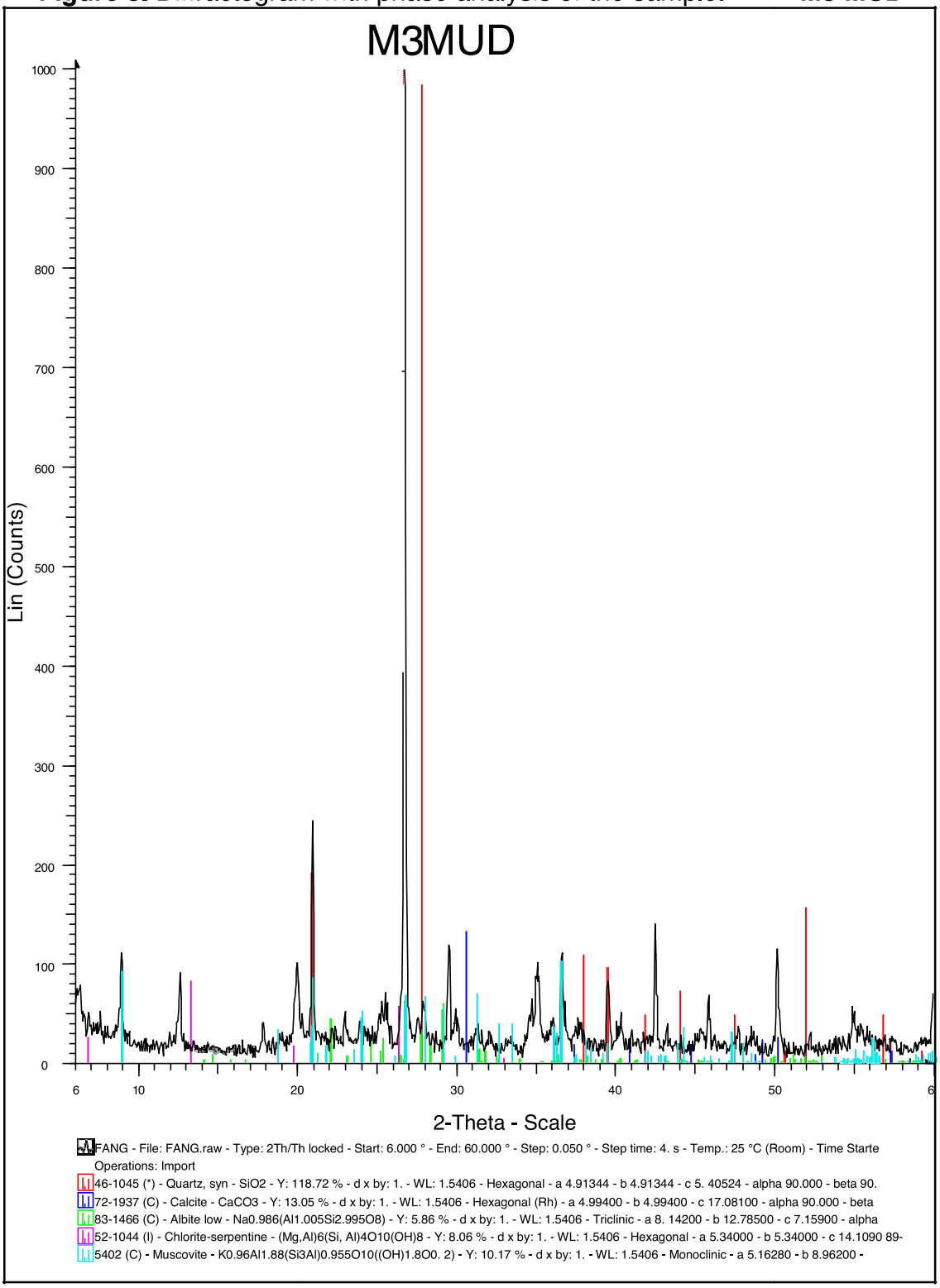

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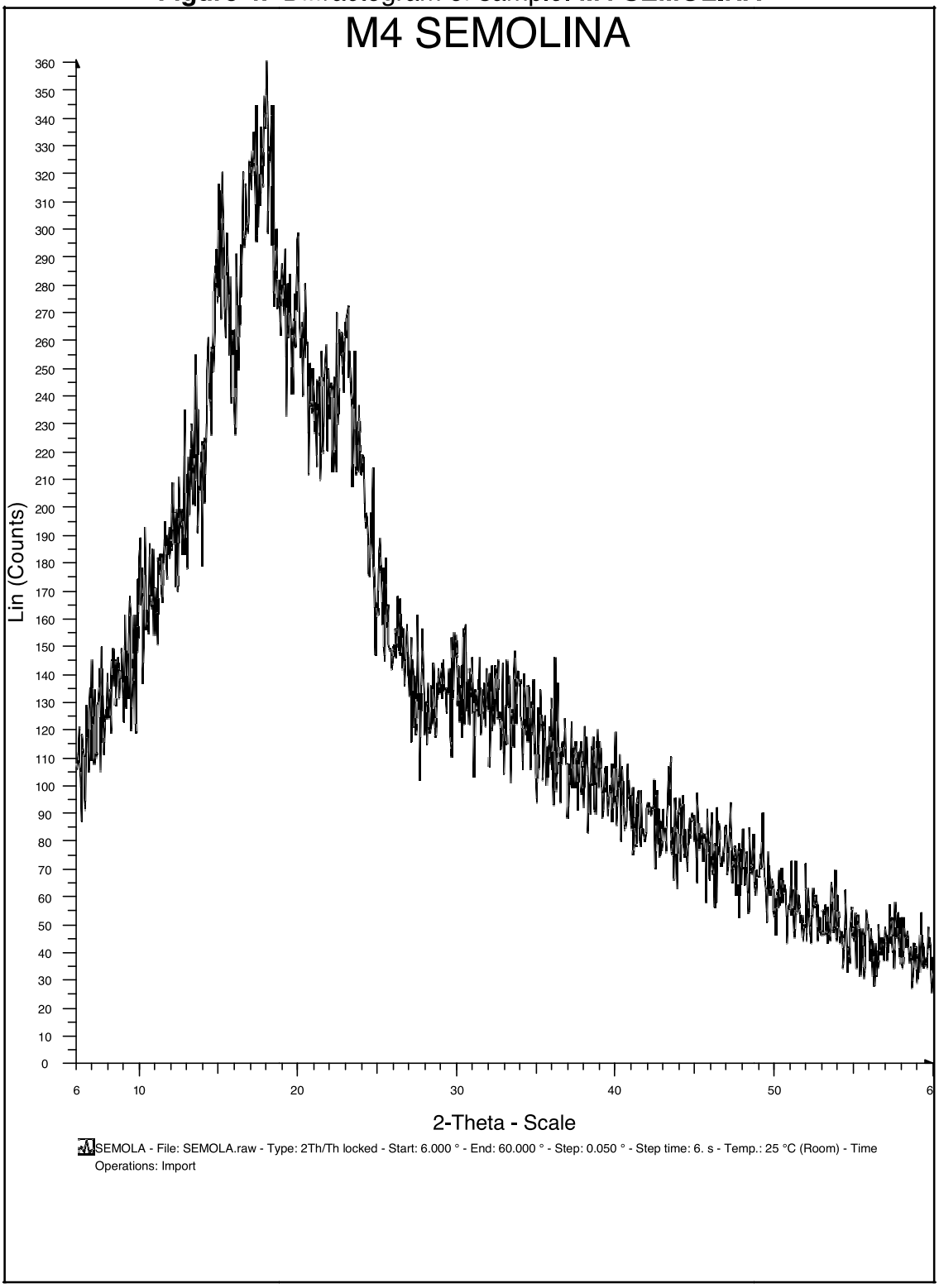
Figure 4. Diffractogram of sample. **M4 SEMOLINA**



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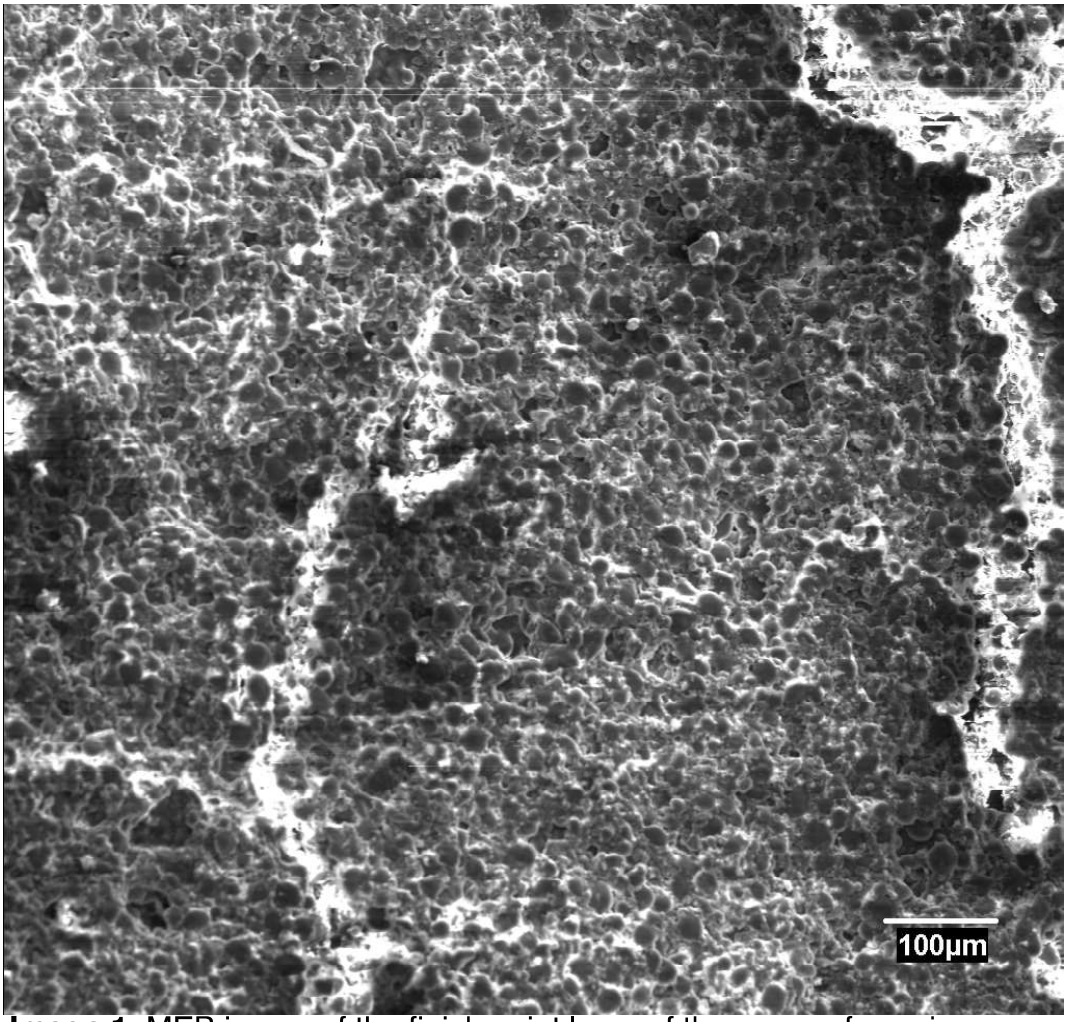

Image 1. MEB image of the finish paint layer of the urn, surface view. Pores and cracks are observed, as well as a grainy surface texture that gives it a dull finish.

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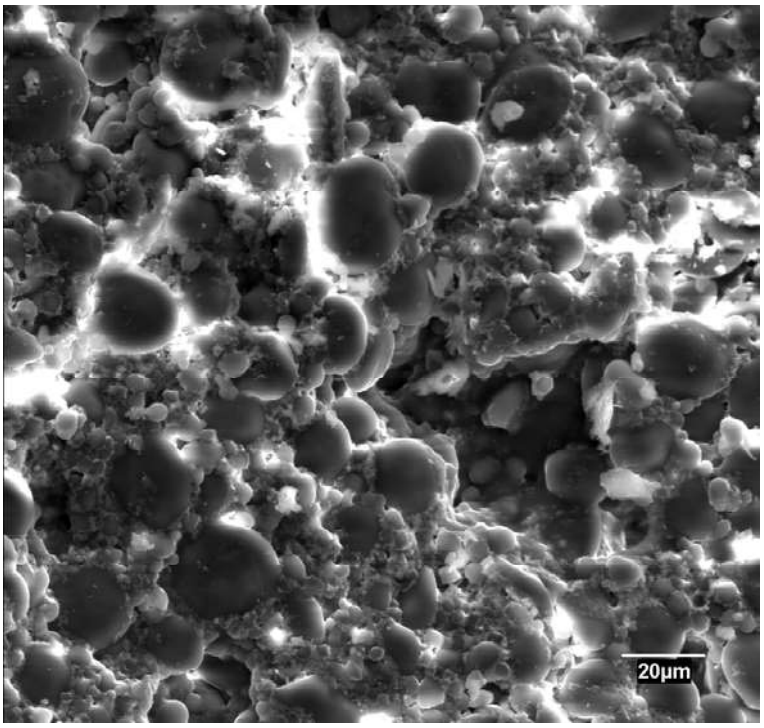

Image 2. Scanning Electron Microscopy image of an area analyzed by EDX technique.

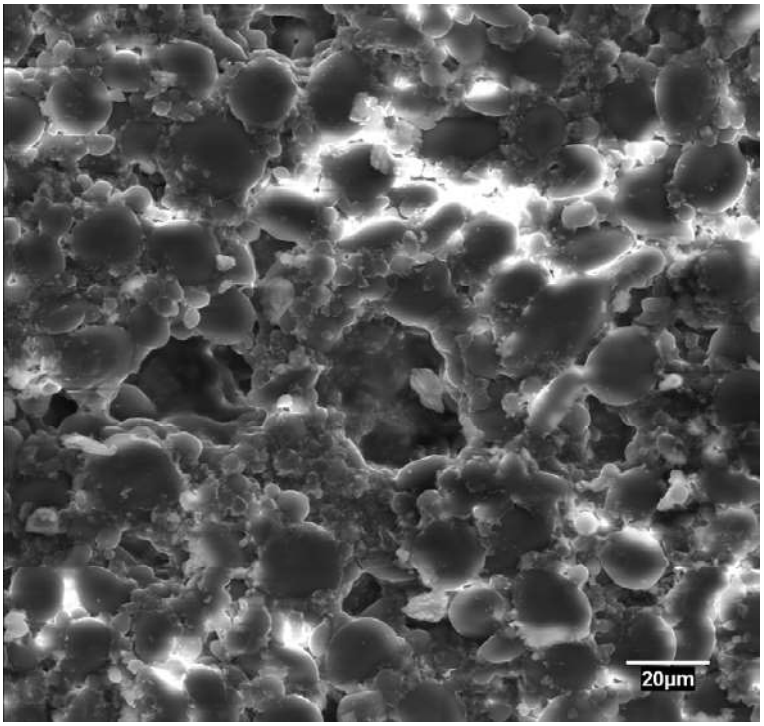

Image 3. Scanning Electron Microscopy image of an area analyzed by EDX technique.

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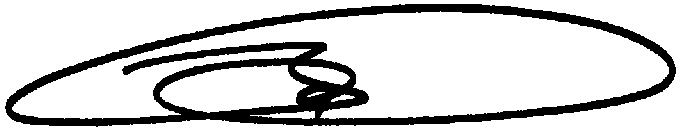
And for the record,

Signed:



Xavier Fontrodona Gubau
Dr. in Chemistry
Technician in charge of the Materials Characterization Unit of the STRs .

Signed:

Jordi Blavia Bergós
Director of Research Technical Services - UdG

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