

**CERÁMICA INNOVA**

VALENCIA (SPAIN)

3<sup>rd</sup> to 7<sup>th</sup> February 2020

7<sup>th</sup> Technology - Business  
Networking Event

Habitat, construction, architecture  
and ceramics sector

# Can the ceramic sector achieve the CO<sub>2</sub> emission reduction targets in the coming years?

*CerOh! Strategies*

Event organized by:



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# Can the ceramics sector achieve the EU's greenhouse gas (GHG) emissions reduction targets?

## ➤ YES!!

- ✓ From a technical point of view, it is possible to achieve a reduction of 85-87% of the CO<sub>2</sub> emissions in 2050
- ✓ But... a deep transformation is necessary of both, current products and processes

YES!!!!

## ➤ How??

- ✓ In **CerOh! Strategies Project**, ITC is analysing different ways to achieve this target in the Tile Ceramic Industry

HOW??

## ➤ Main objective:

- To study strategies based on the principles of **circular economy** to adapt the ceramic tile manufacturing industry to the **low-carbon** scenario proposed for the year 2050

CerOh! Strategies

# CerOh! Strategies Project

- Project: **Circular economy strategies for a low-carbon ceramic industry**
- Founded by:
  - **IVACE – Instituto Valenciano de Competitividad Empresarial**
  - **Programa Operativo FEDER de la Comunitat Valenciana 2014-2020**
- Call: **IMDEEA -Programa de I+D en colaboración con empresas**
- Grant Agreement: **IMDEEA/2018/12 – IMDEEA/2019/5**
- Country: **Comunidad Valenciana (Spain)**
- Starting: **1<sup>st</sup> March 2018**
- Ending: **28<sup>th</sup> February 2021**
- Supporting companies:



**GENERALITAT  
VALENCIANA**

**ivACE**  
INSTITUT VALENCIÀ DE  
COMPETITIVITAT EMPRESARIAL



**UNIÓ EUROPEA**  
Fons Europeu de  
Desenvolupament Regional

*Una manera de fer Europa*



**ARGENTA**



**AMIZALSA**

# CerOh! Strategies Project

## ➤ Optimization of current processes:

- Increase solid content of suspensions (atomization)
- Reduce the sintering temperature by means of extremely fusing compositions
- Compositions of wall tile without carbonates



## ➤ Alternatives to current products

- Glazes without frits
- Reduce the support thickness
- Alkali activated materials and Si-Ca tiles as alternatives to ceramic tiles



## Different ways to reduce emissions

## ➤ Alternatives to current processes

- Preparation of compositions by dry routes
- Microwave or electric drying
- Full-digital decoration
- Other technologies to sinter tiles: electric kilns, etc.
- To unify compositions in only one support
- Develop glazes with different finishes to be used in this only one support



## ➤ Life Cycle Analysis



## ➤ Implementation of Industry 4.0 concept

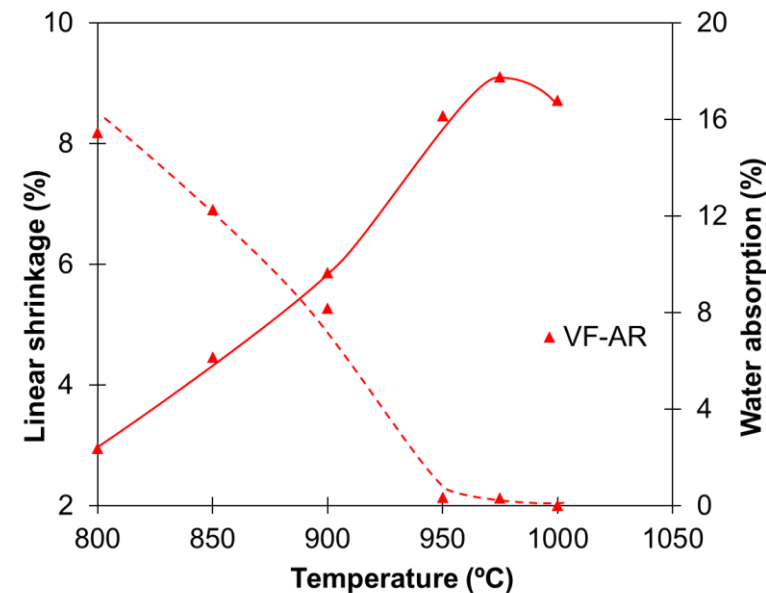
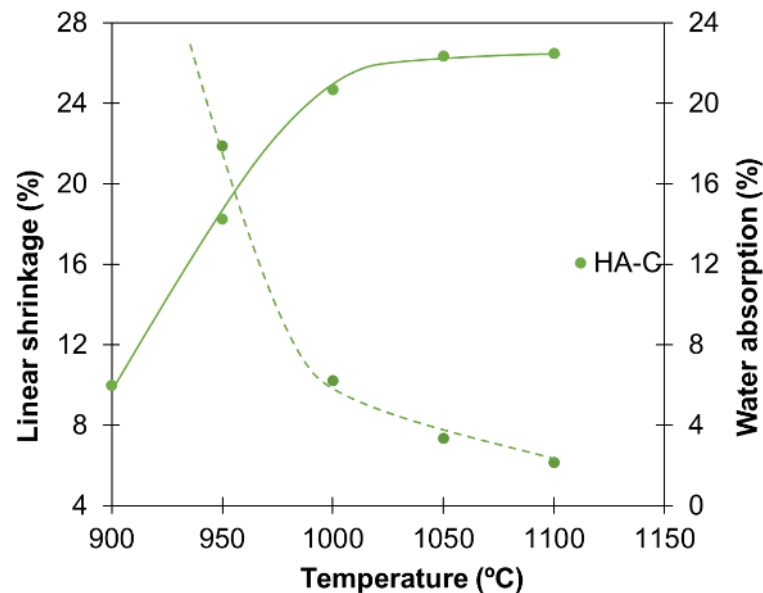


# Optimization of current processes. Examples

- ✓ New ceramic compositions to **drastically reduce the firing** temperature (more than 200 °C) with respect to the current ones

Using of different fluxing materials, as:

- Hydroxyapatite ( $\text{Ca}_5(\text{PO}_4)_3(\text{OH})$ ): **HA-C composition**
- Recycled glasses from different sources, as green containers, lamps, etc.: **VF-AR composition**



# Optimization of current processes. Examples

- ✓ **Tiles without carbonates** and with lower firing temperature: wollastonite as an alternative to calcium carbonate in white firing wall tile compositions, formulating compositions that do not involve a very high increase in cost

Composition	STD	W18	W16V	W10V	W13V
Wollastonite (%wt)	0	18	16	10	13
Temperature (°C)	1140	1140	1100	1100	1100
Linear shrinkage (%)	0.2	1.9	2.6	2.6	2.5
Water absorption (%)	16.5	10.9	10.8	10.8	11.0
Emissions reduction (%)	-	42	45	47	46

# Alternatives to current products. Examples

- ✓ The most challenging route: “**unfired**” tiles, by means of developing low temperature glazes for alkaline activated products and for Si-Ca tiles
- ✓ **Reducing the thickness** of conventional ceramic tiles by developing formulations with high mechanical strength both before and after firing. So far, thickness has been reduced by more than 30%  
(C=compaction, M=milling)

Composition	Red floor tile		Red wall tile		White wall tile	Porcelain tile
Modified property	C	M	C	M	C	C
Mechanical strength increase (%)	10	25	10	30	10	10
Emission reduction (%)	5	12	5	14	5	5

# Alternatives to current products. Examples

- ✓ **Glazes without frits.** Using raw materials with high fusibility: nepheline, spodumene, ZnO, etc.

Sample	ESM-19	ESM-11	ESM-25	ESM-28
Temperature (°C)	1180	1180	1100	1100
Brightness (60°)	6	60	87	27
Aspect	Matte semi-transparent	White glossy	White high glossy	Satin semi-transparent
				



# Alternatives to current processes. Examples

- ✓ **Energetic transition**: from fossil energy sources to not based on them, incorporating renewable energies into the manufacturing process
- ✓ Granulation technologies plus dry milling to produce **granulates**
- ✓ **Infrared or microwave** dryers
- ✓ **Electric** kilns
  - Data for production of 1000 m<sup>2</sup> with continuous kilns (year 2018)

Parameters	Gas kiln	Electric kiln
Maximum temperatura (°C)	1200	1200
Electric cost (€/year)	16,900	355,680
Gas cost (€/year)	133,000	0
CO <sub>2</sub> emissions costs (€/year)	16,120	0
<b>Total costs (€/year)</b>	<b>166,020</b>	<b>355,680</b>

# Major drawbacks

- ✓ Most of the proposed actions in the *CerOh! Strategies Project* involve a high cost increase
- ✓ To reduce this increase in cost it is absolutely necessary:
  - To incorporate renewable energies in the ceramic plants
  - A substantially reduction in the cost of electrical energy



All this will require a strong commitment from the **public administrations**

# Thanks!

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