Innovative green ceramic tiles from End-of-Waste Materials

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FINCIBEC

CENTRO CERAMICO

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Waste synergy in the production of INnovative CeRamic tiles

WINCER

New concept of traditional ceramic tile mix

PLASTICIZER, FLUXING AND TEMPERING agents

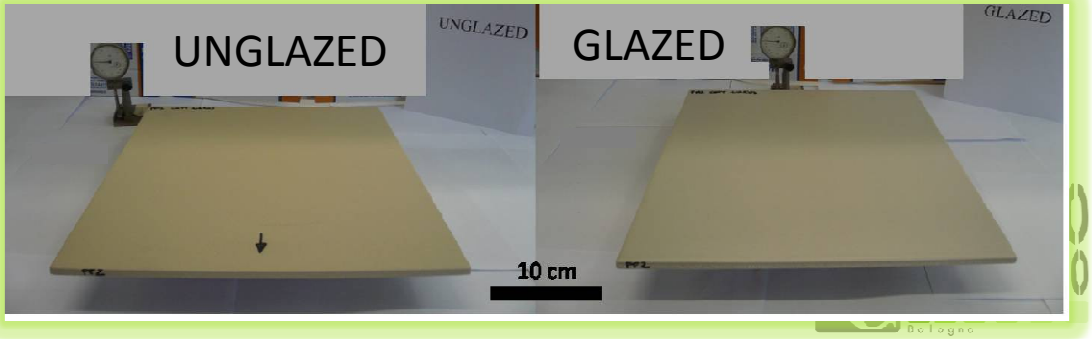
- natural clays, feldspars and sands -

are **pre and post consumer wastes (100%)**

From laboratory

to industrialization

Duration: 3 years
(2013-2017)



RETE ALTA TECNOLOGIA EMILIA-ROMAGNA HIGH TECHNOLOGY NETWORK

PIATTAFORMA COSTRUZIONI

State of the Art

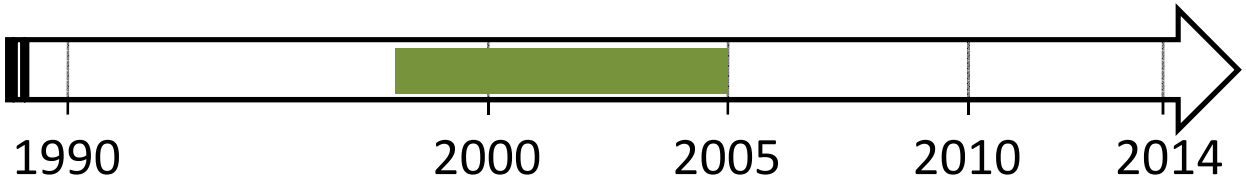
SCRAP GLASSES: fluxing/tempering

- Reference material: PORCELAIN STONEWARE
- ***Packaging SODA LIME GLASS - from separately urban collection***
- ***Strontium-barium-lead GLASS – from monitor TV e CRT***

➢10% of soda lime glass
➢2-5% CRT glass

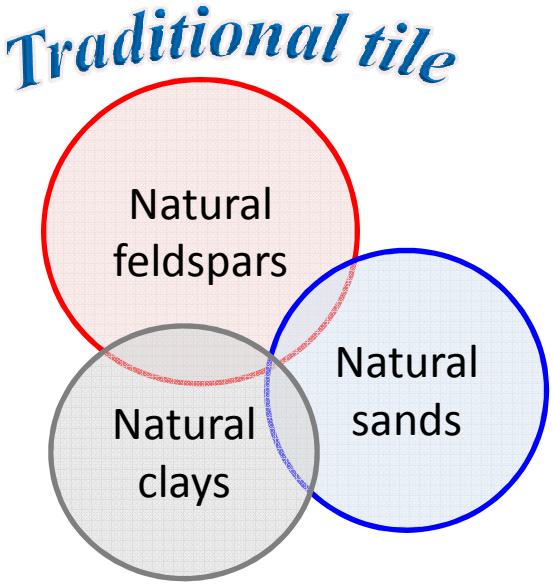
Lower sintering temperature(~20 C)
Performances similar to a traditional ceramic

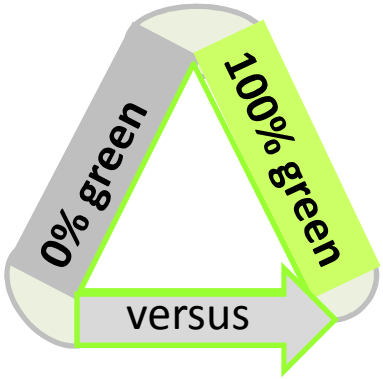
Problem
Stability during firng

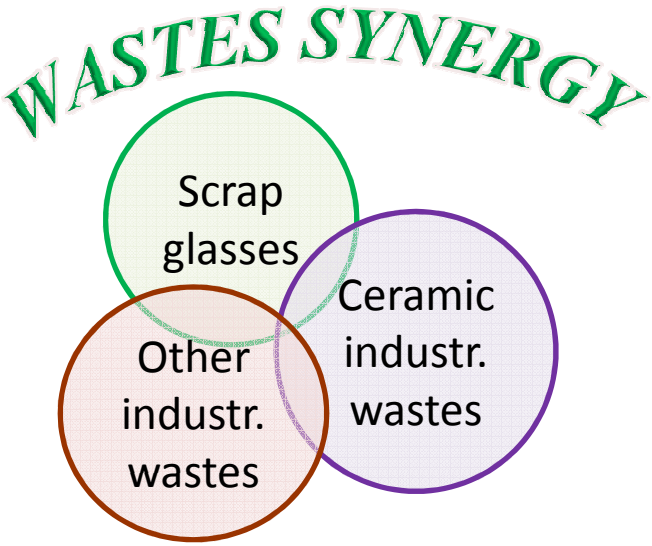


WINCER overview

Mixing design





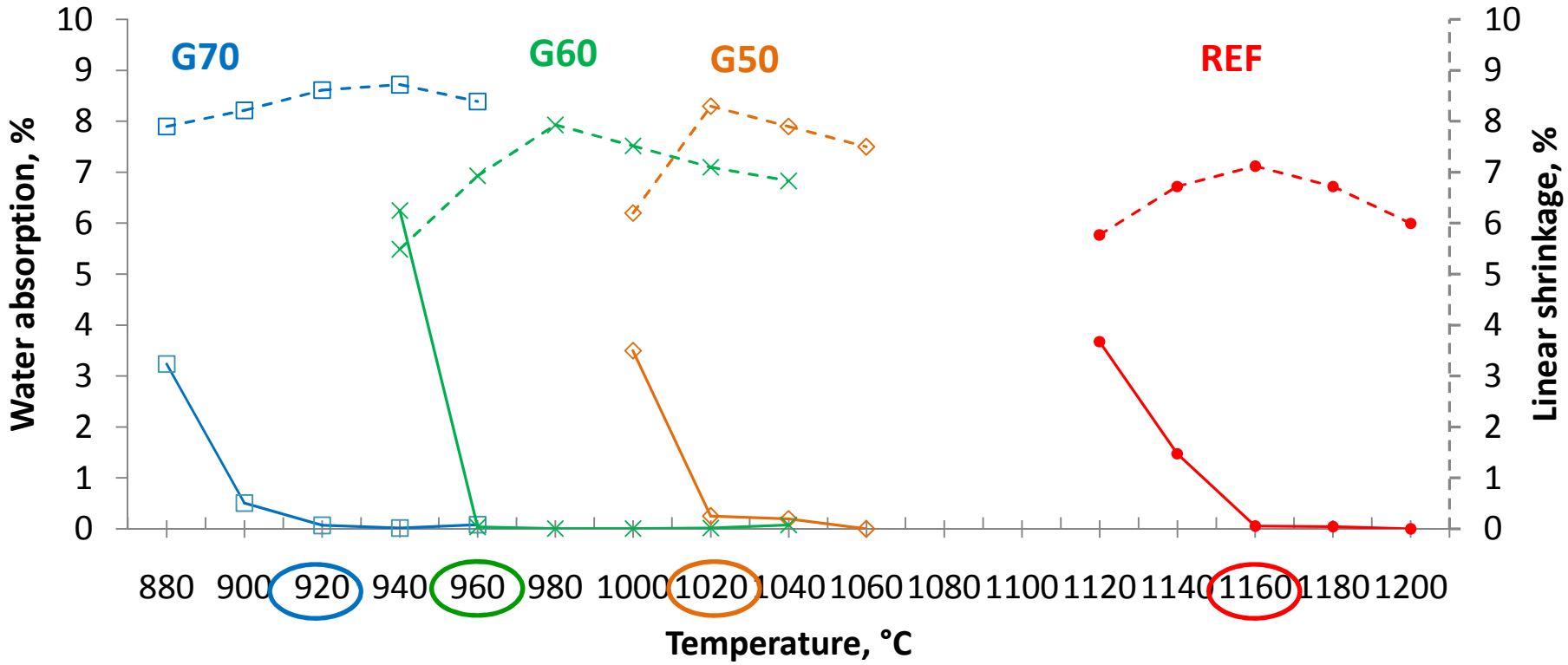


REF	Traditional porcelain stoneware *(NATURAL RAW MATERIALS)*	
G50	50% post consumer wastes	50% pre consumer wastes
G60	60% post consumer wastes	40% pre consumer wastes
G70	70% post consumer wastes	30% pre consumer wastes
G60L	60% post consumer wastes	+ Exhausted Lime
G60A	60% post consumer wastes	+ Alumina

Firing behaviour

Scrap glass effect

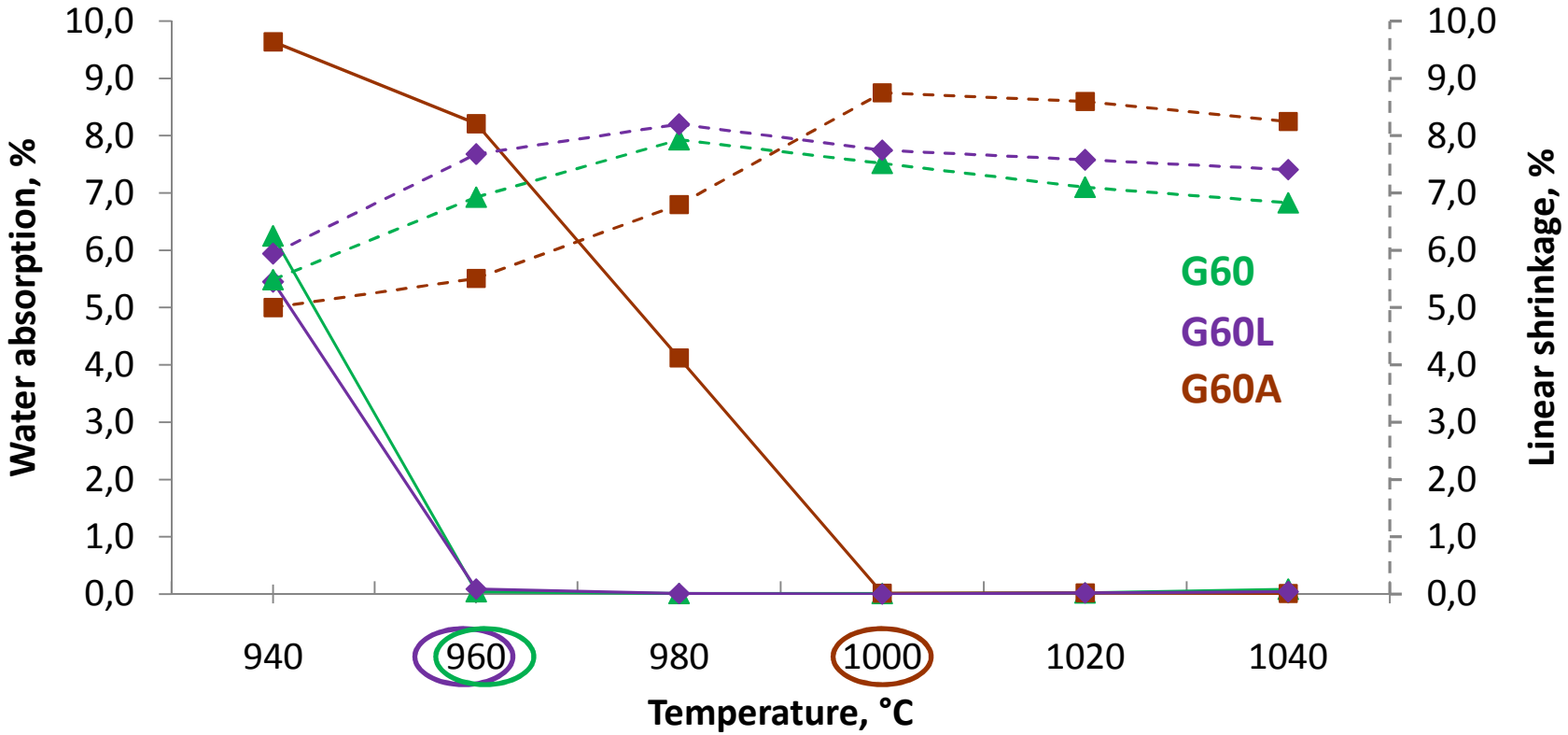
Laboratory furnace
Heating rate 10°C/min



Firing behaviour

Additives effect

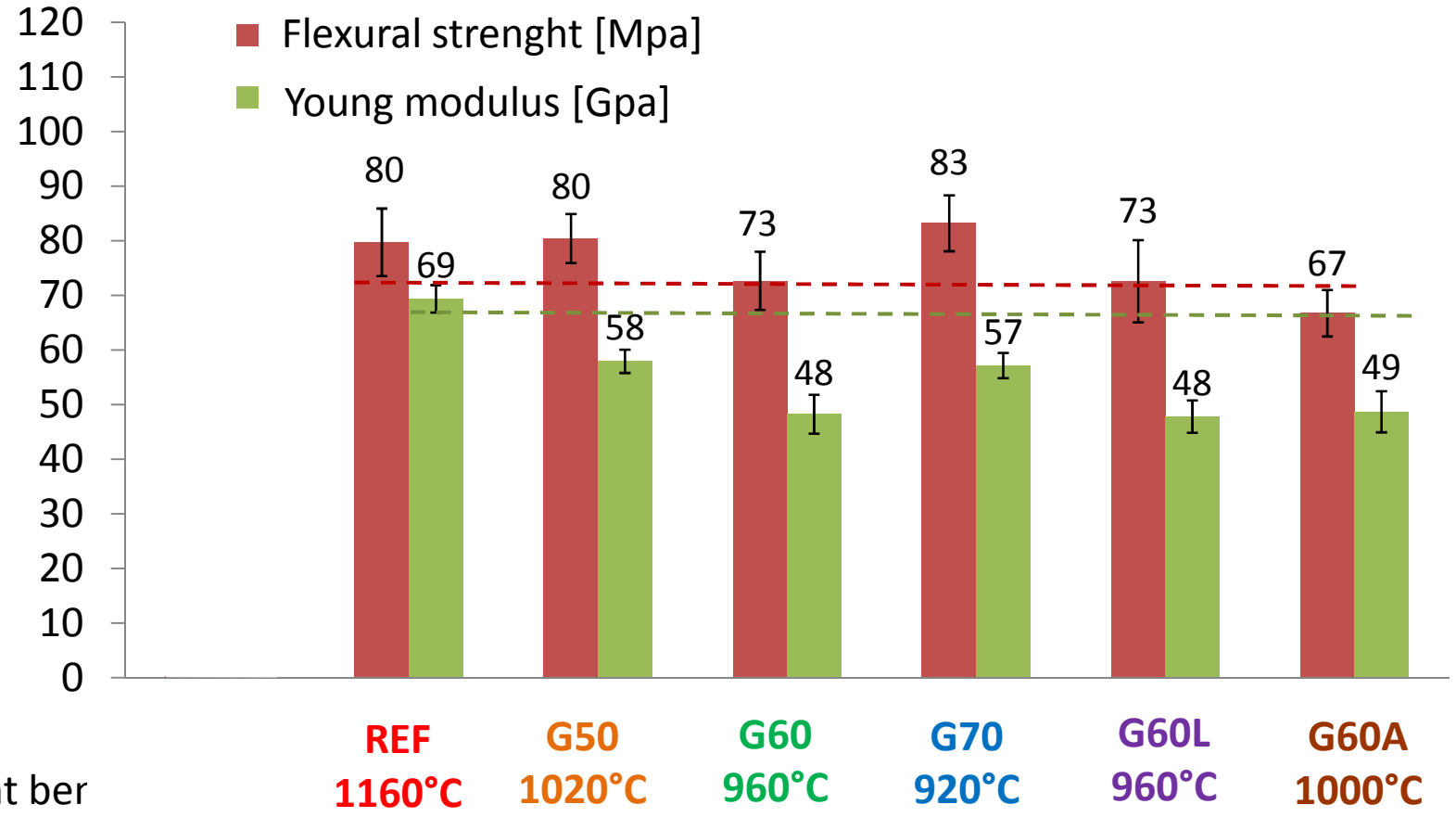
Laboratory furnace
Heating rate 10°C/min



MECHANICAL PROPERTIES

Fired samples (1/2)

On 20 valid results

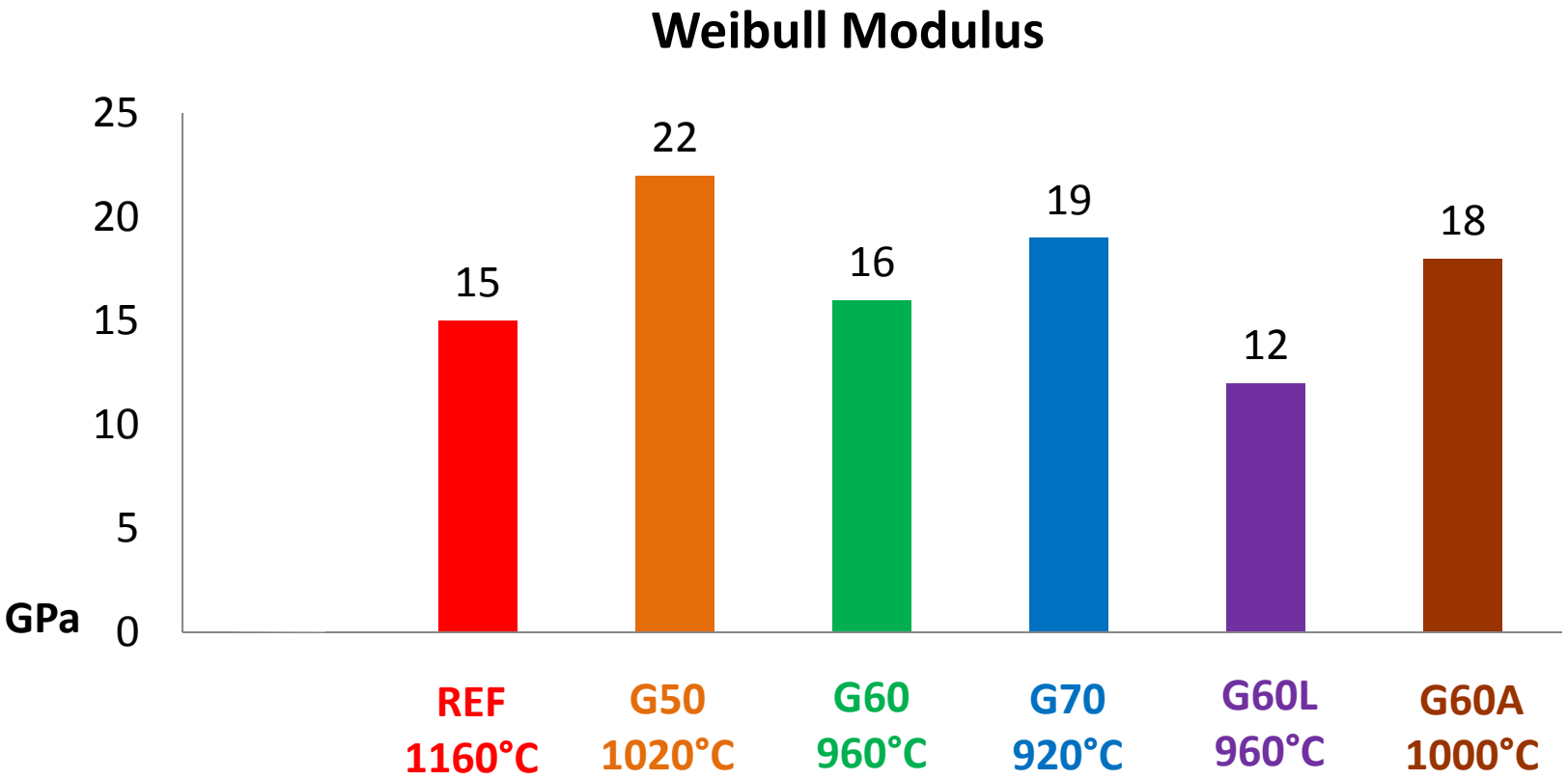


Three point ber
- Roller span 60mm
- Crosshead speed 5mm/min
- Cell 2KN

MECHANICAL PROPERTIES

Fired samples (2/2)

On 20 valid results

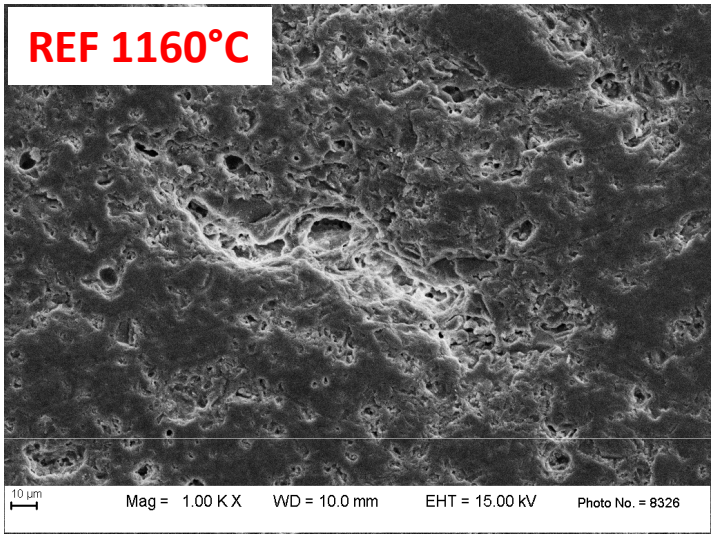


Evaluated by least squares method and linear regression analysis.
Probability estimator: Pn = (i−0.5)/N.

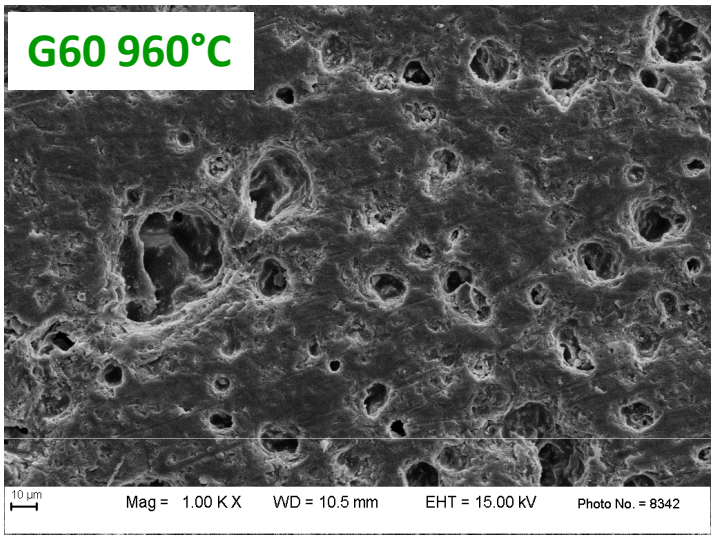
MICROSTRUCTURE

Polished surfaces, SE- SEM

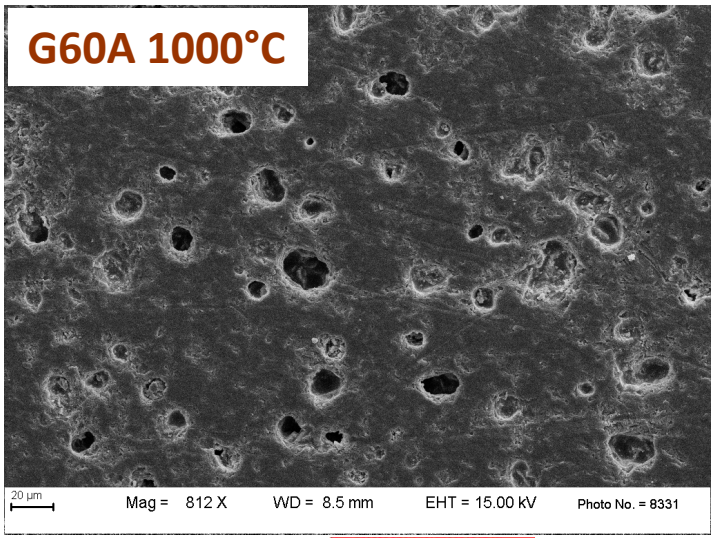
REF 1160°C



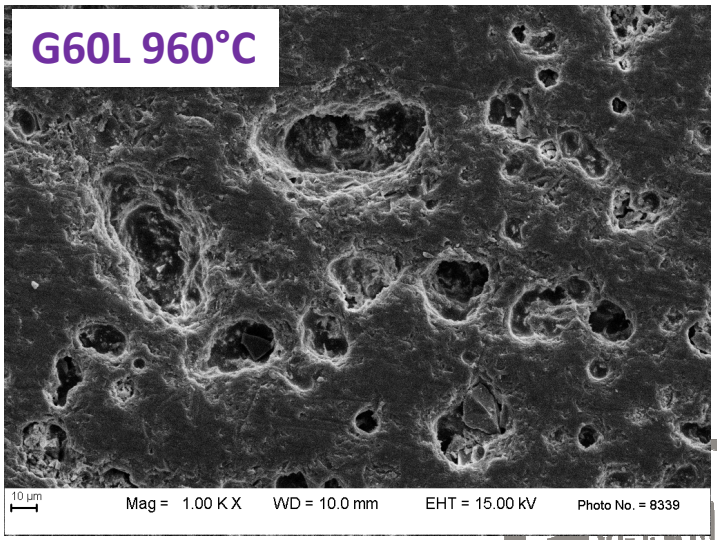
G60 960°C



G60A 1000°C

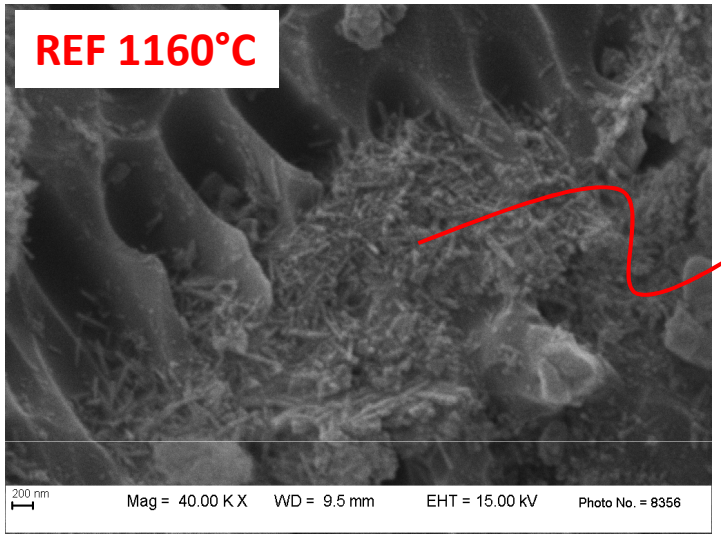


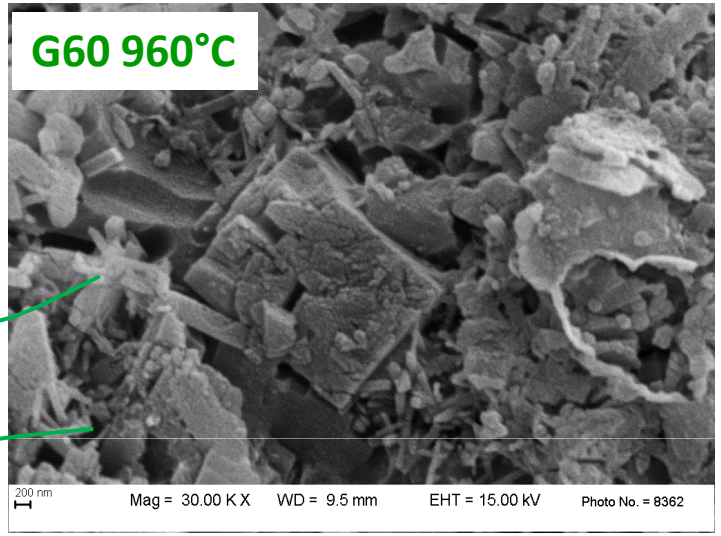
G60L 960°C

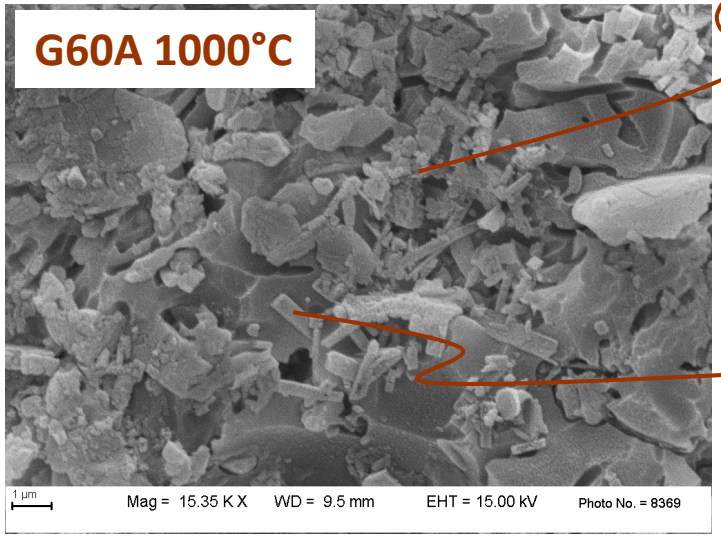


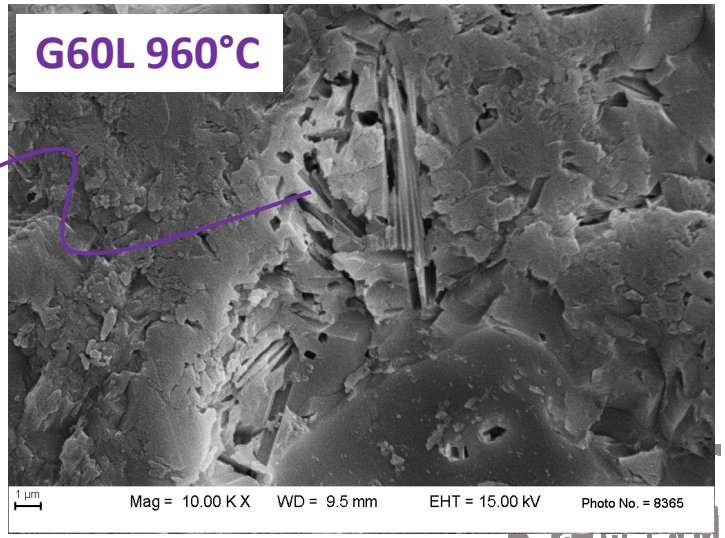
MICROSTRUCTURE

HF1%-Etched surfaces, SE- SEM









Mullite

Plagioclase

Wollastonite shape

Nepheline

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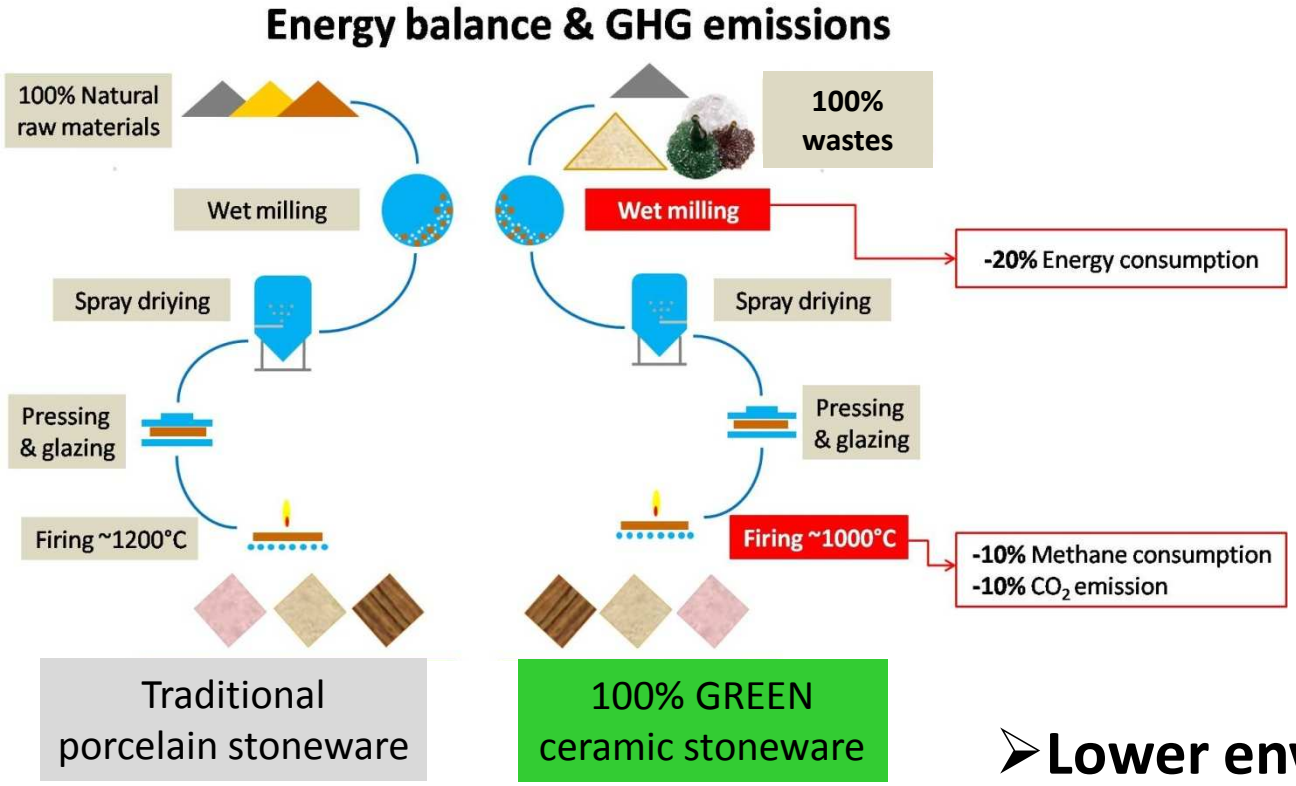
PIATTAFORMA COSTRUZIONI

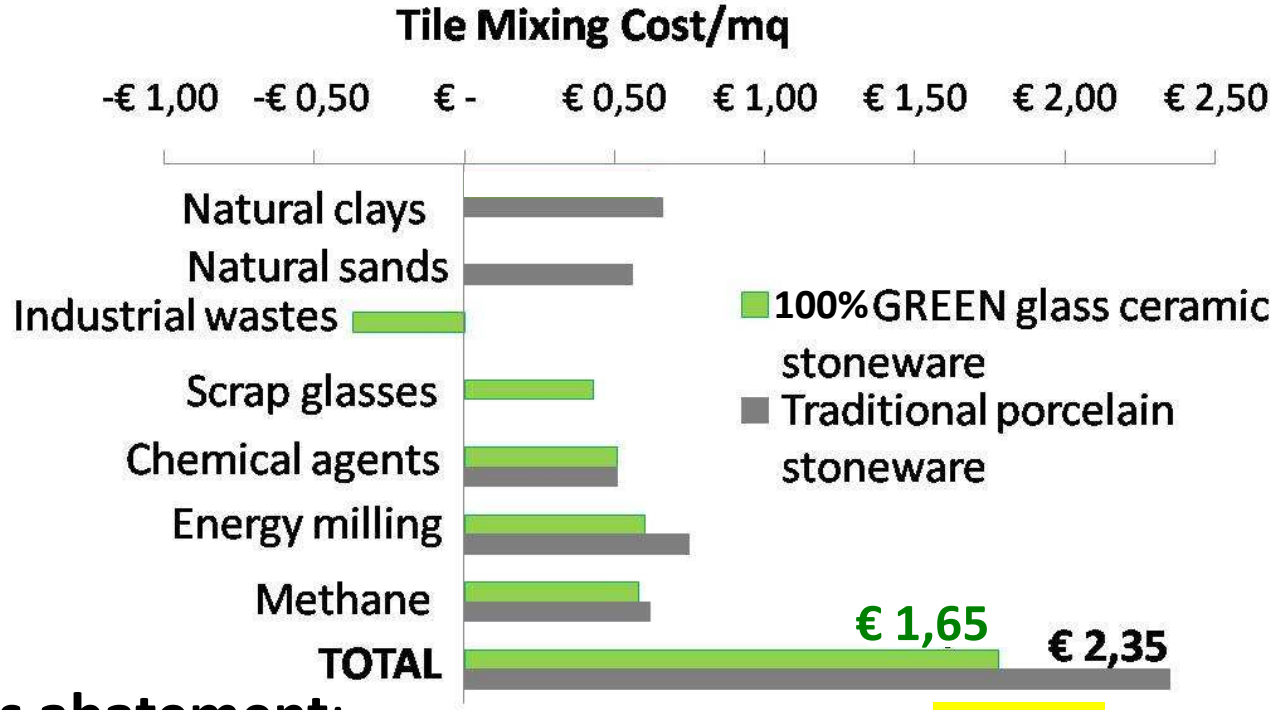
Conclusion



➢**Lower environmental impact**:

- Lower CO_2 emission
- Lower methane consumption
- Lower energy consumption
- Lower natural resources consumption

Conclusion



- **Industrial fixed costs abatement**:
  - Lower expense for raw materials
  - 0% landfill confinement
  - Recovery of industrial wastes
  - Lower energy and methane consumption

For your kind attention!

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