





# Development of thermal shock experimental protocol of carbon-based refractory materials

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## Study subject : Thermal shock



## **Testing methodoloy**



#### VESUVIUS

3

## Study product/specimen





The current tested specimen geometry and dimensions

Specimen tested during the experiment



The specimen tested parameters

#### **Testing protocol:**

- **Specimen**: Mix A and Mix B with different carbon content
- Source of heat: induction heating
- Deformation measurement: LVDT type extension adapted to high temperature and thermally stable
- **Observation and inspection:** Thermographic camera









## **Characterization protocol**



## Results: Mix A - Specimen N1 and N2



## Results: Mix B - Specimen N3 & N4



#### Crack initiation: Comparison between N3 and N4



### **Results- Mix A and B**



Mix A: Infrared camera recording during cracks initiation and propagation

1471.8 1062.7 0:02:05,18 653.5

Mix B: Infrared camera recording during cracks initiation and propagation



Mix A : Apparent cracks in the middle of the flat side



Mix B : No Apparent cracks in the middle of the flat side

## Results: Mix A and B – Comparaison between deformation evolution with time

![](_page_11_Figure_1.jpeg)

![](_page_11_Picture_3.jpeg)

## Summary: Firsthand verification of the experimental protocol

![](_page_12_Figure_1.jpeg)

The experimental results align with the already tested properties by the industry: Mix B with a higher thermal conductivity and lower young modulus had a lower thermal gradient during the heating and cracked in a ductile way

## Futur steps

![](_page_13_Figure_1.jpeg)

![](_page_13_Picture_2.jpeg)

![](_page_14_Picture_0.jpeg)

![](_page_14_Picture_1.jpeg)

![](_page_14_Picture_2.jpeg)

## Thank you for your attention

![](_page_14_Picture_4.jpeg)

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![](_page_14_Picture_6.jpeg)

![](_page_14_Picture_7.jpeg)