Simulation of vacuum induction furnace heating parameters for sintering YAG ceramics for Sirius using CENOS

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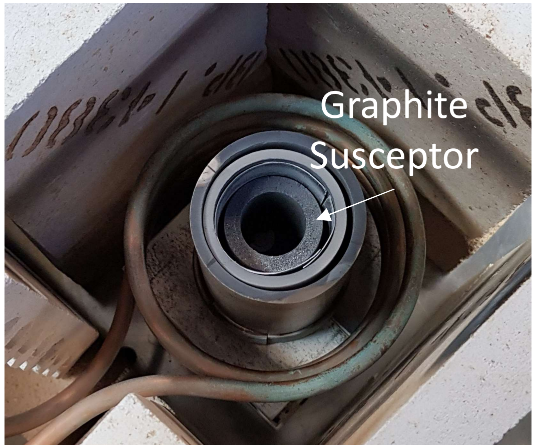
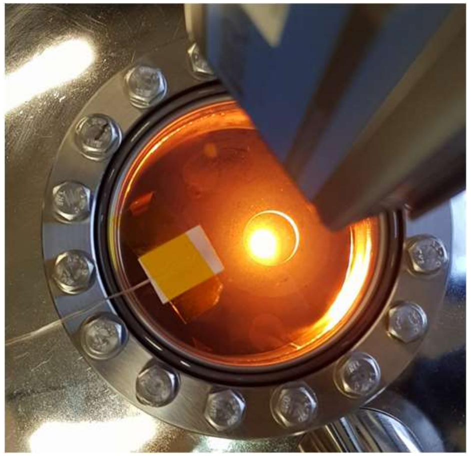
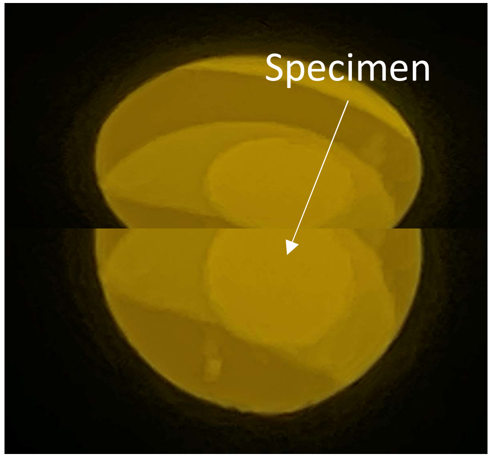
Furnace requirements

- Vacuum atmosphere
- Heating rate of 35°C/min.
- Minimum temperature of 1700 °C

The induction heating method works due to the graphite susceptor used as heating element for the ceramic specimen.







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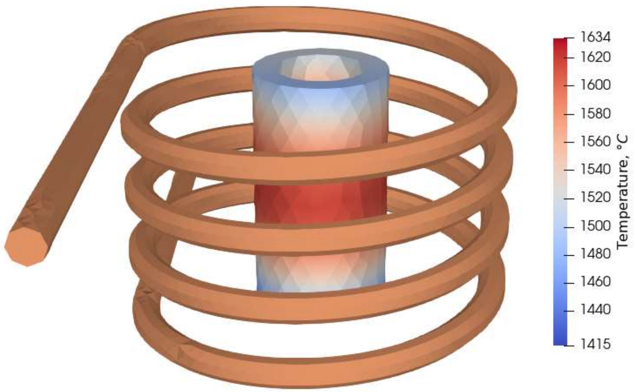
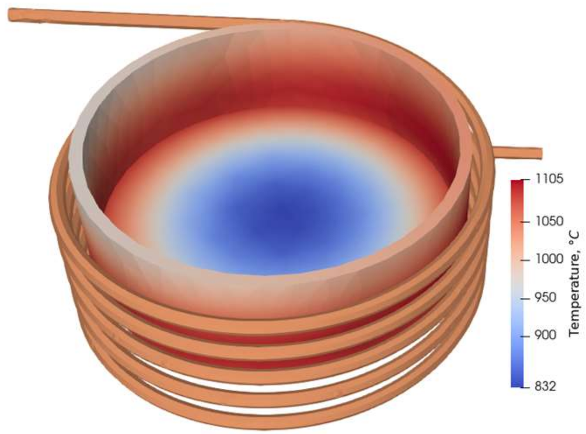
CENOS Simulation

- Systems frequency
  - 30 kHz
  - 250 kHz
- Susceptors diameters
  - 30 mm
  - 100 mm

The CENOS allows to check the best fit of frequency and limits of susceptor dimensions





CENOS Simulation

The temperature measured in the simulation reached the original measurement, increasing the power input parameter. The results were very useful for defining the system, but we need to improve some details to allow more accuracy in the test

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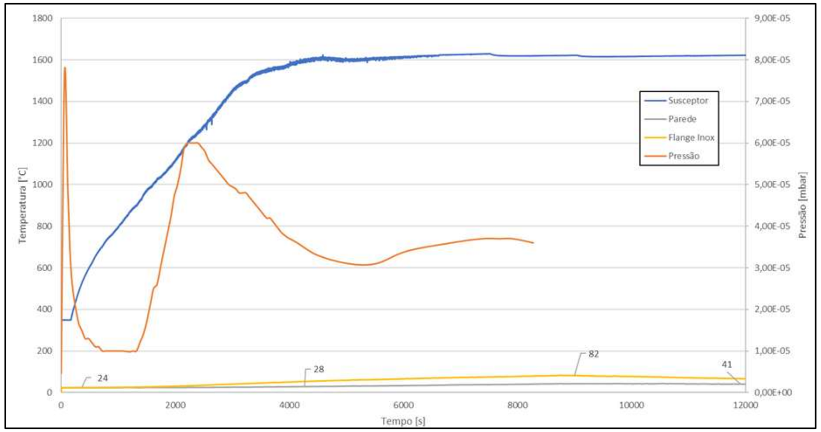
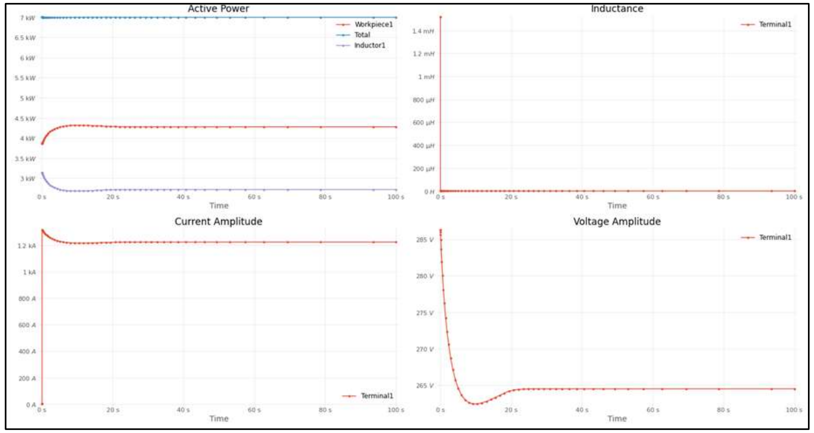
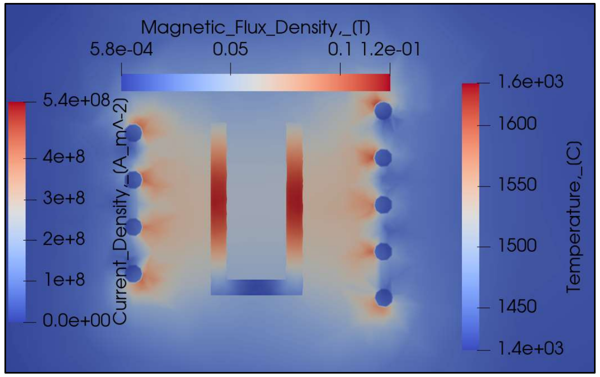
Real measurement



CENOS Results





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Optimizing heat treatment parameters for NbTi ingots in a vacuum induction furnace using CENOS simulation software

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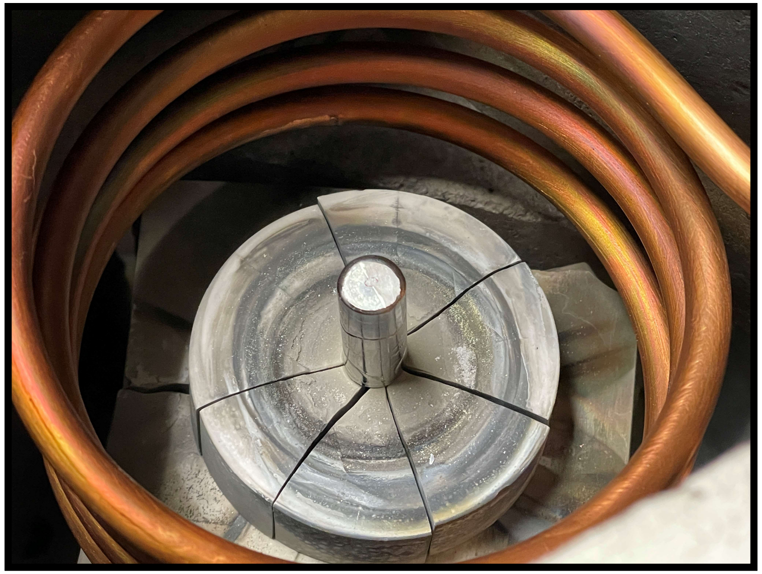
Furnace requirements

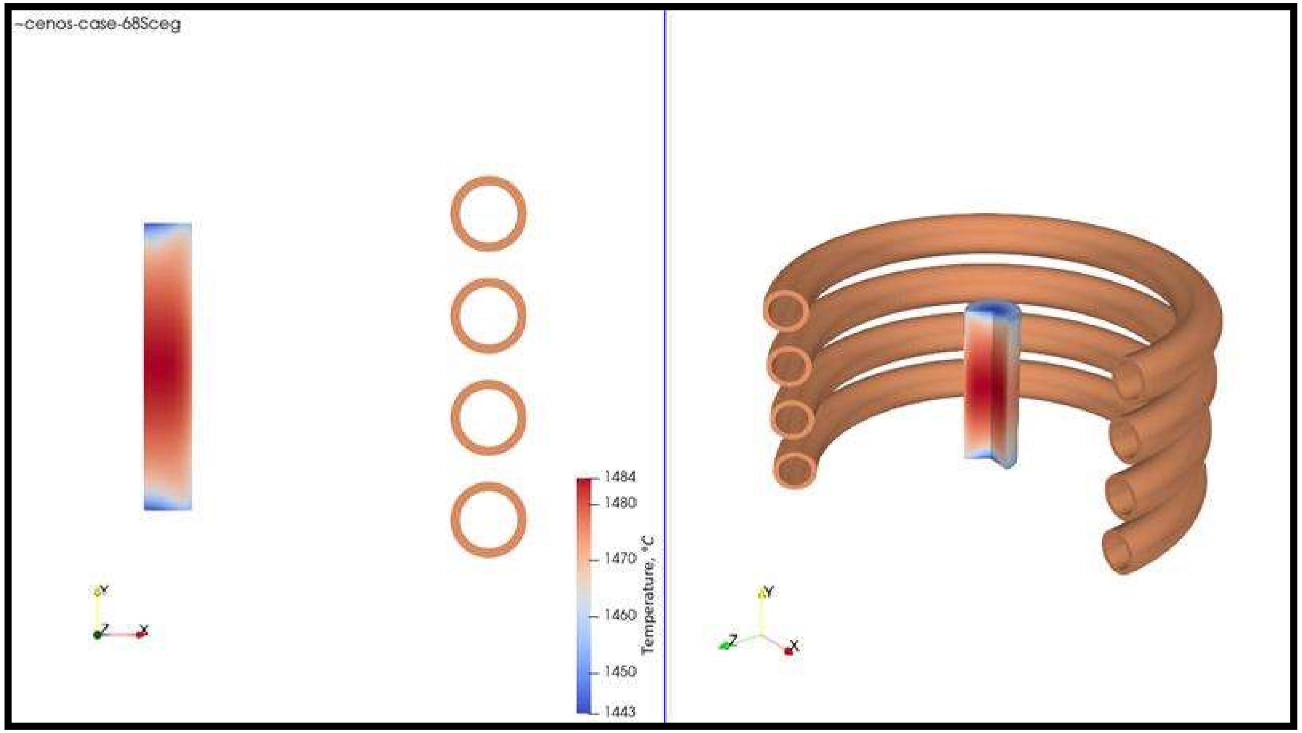
- Vacuum atmosphere
- Heating rate: 35°C/min.
- Range of temperatures: 800 - 1500 °C

Heat treatment of NbTi ingots is essential for transforming the dendritic microstructure into uniform equiaxed grains. Achieving high cooling rates during homogenization treatment is crucial to prevent the precipitation of secondary phases.



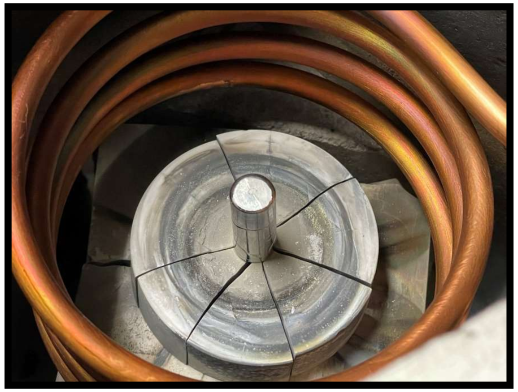
CENOS Simulation

- NbTi ingot dimensions
  - Ø: 10 mm
  - L: 25 mm

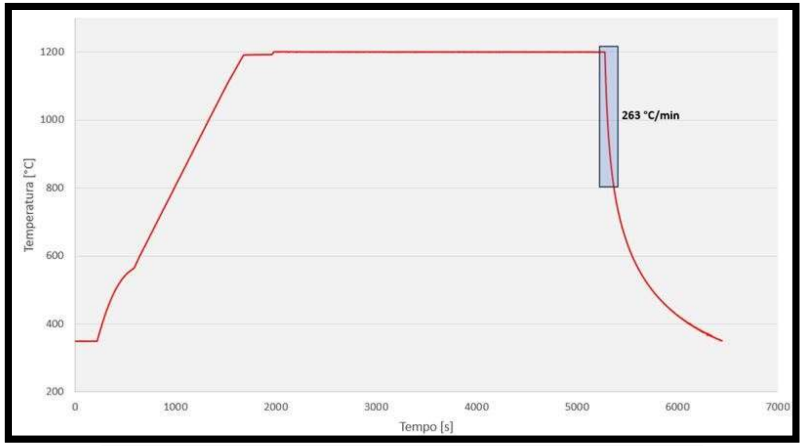


CENOS simulations were employed to explore the induction coupling and temperature gradient within small-dimension ingots (10 mm diameter, 25 mm length). Additionally, the study focused on determining the optimal frequency settings corresponding to different temperature conditions.

CENOS Simulation



The optimal design parameters facilitated the attainment of a homogeneous equiaxed microstructure. Subsequently, the project will progress to investigating induction coupling and temperature gradient across multiple NbTi ingots, expanding beyond single-ingot analysis, utilizing CENOS software.



Experimental temperature measurements

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