In situ studies of NiTi and NiTiCu orthodontic wires

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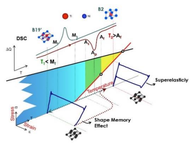

Workshop on Shape Memory Alloys
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ABSTRACT

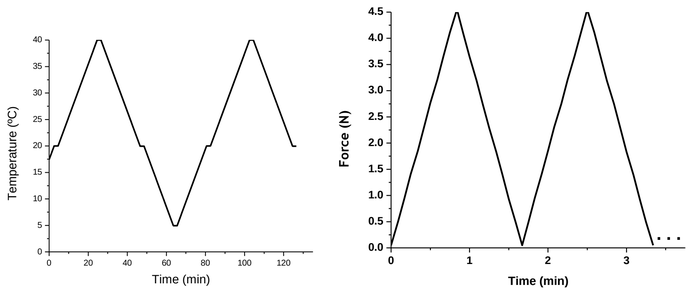
In this study, a class of NiTiCu orthodontic wires thermal activated was analyzed. This wire (CuNiTi Thermocopper NiTi – 35ºC/Morelli) has 6%Cu. Microstructural characterization of the wire was performed using Differential Scanning Calorimetry (DSC), in situ synchrotron-based x-ray diffraction (SXRD) and three-point bend test was performed by TMA analysis in the temperature range (5 to 40 °C). This study provided a better understanding of the behavior of these wires.

EXPERIMENTAL DETAILS

CuNiTi Orthodontic Wire -Thermocooper - 35ºC Morelli - 0.4 x 0.55mm

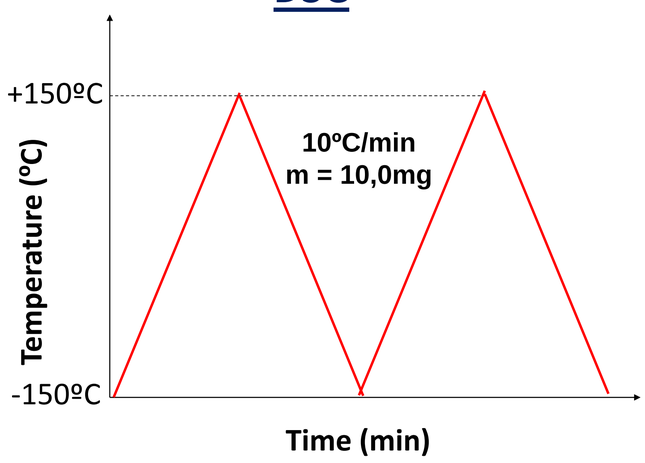
3-Point Flexion Test

TMA



4.5 N 0.01Hz 05 to 40ºC 1ºC/min

DSC



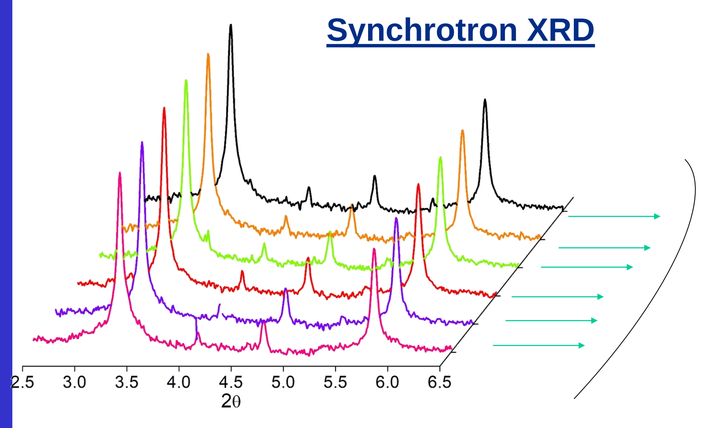
Phase Transformation Temperatures.

Shynchrotron XRD

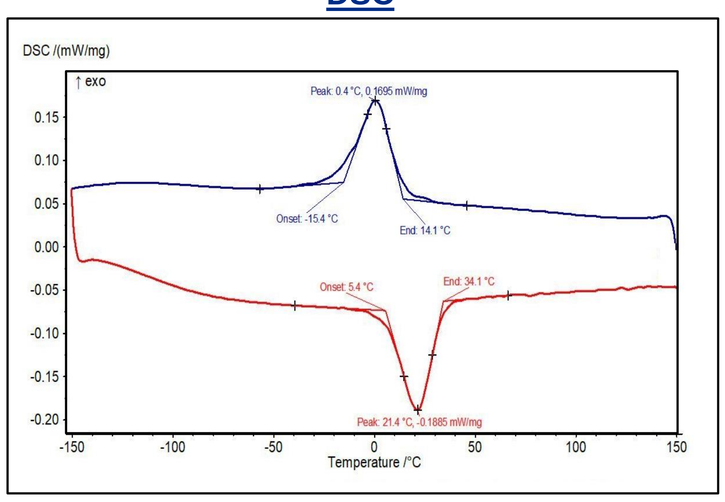
P07 High-Energy Materials Science (HEMS) of Petra III/DESY,
Wavelength: 0.124 Å (98 keV) beam spot 200 × 200 μm2
Samples scanned along the length of the wire
2D detector Mar345, at 1.5 m from the sample.
Raw 2D images treated using Fit2D program
by integration from 0° to 360° (azimuthal angle).

RESULTS AND DISCUSSION

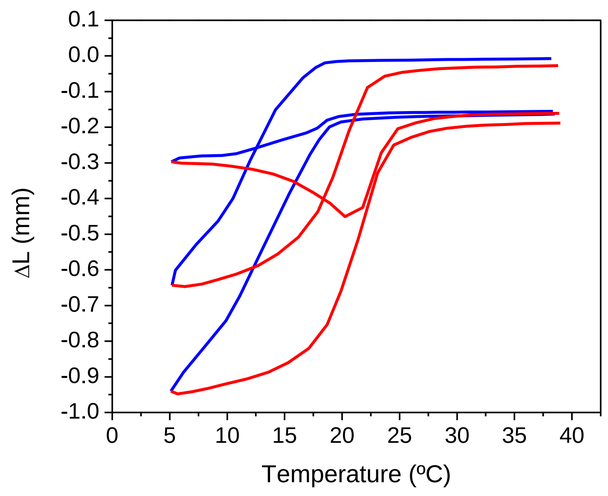
Synchrotron XRD



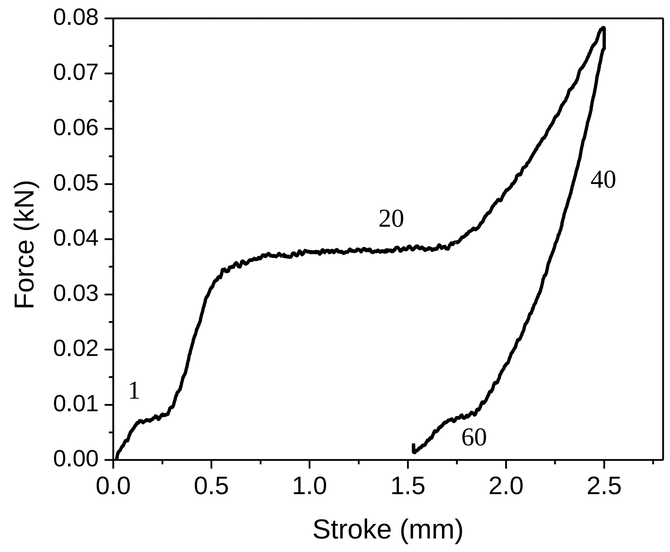
DSC

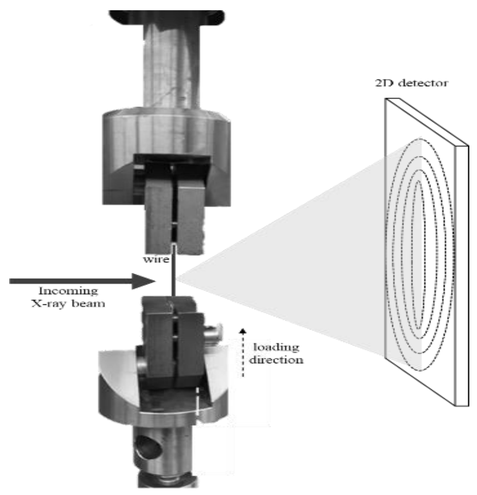


TMA

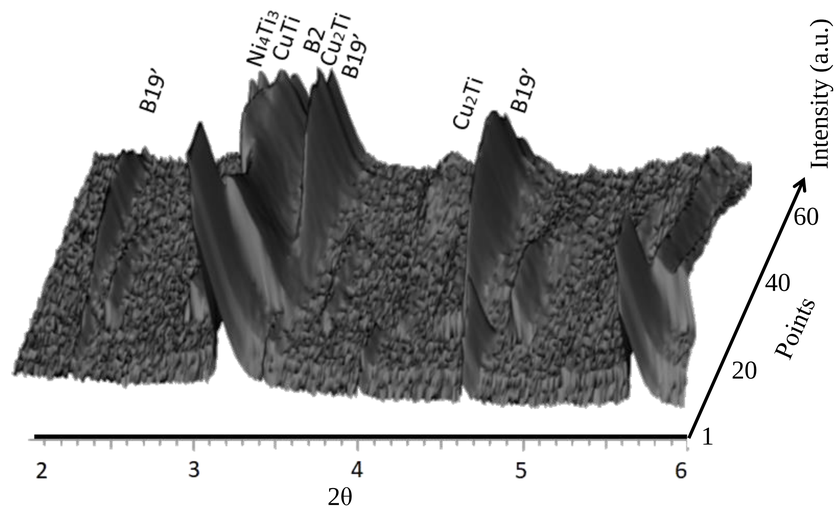


Tensile Test





Synchrotron XRD – *in situ*



CONCLUSIONS

- ✓ A_f temperature is close 35ºC. So, it is a suitable process in view of orthodontic application.
- ✓ In Synchrotron XRD results it is possible to observe the different phases that occur during the tensile test.
- ✓ It is possible to observe the precipitates TiCu and Ni_4Ti_3.

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COMPETE 2020

MIDAS
Micro and Nanoscale Design of Thermally Actuating Systems

CAPES
I M E
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