

Experimental Continuous Casting of Nitinol

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Continuous Casting Device

The laboratory vacuum-induction melting furnace and the vertical continuous casting device are designed for casting directly from the melting crucible. The whole process can be completed in a vacuum or protective atmosphere. The melting furnace can also be used without the continuous caster, as a conventional induction melting furnace. In that case, the bottom with the opening is replaced with one without opening. A schematic drawing of the setup is presented in the Figure S1-1, a photograph in the Figure S1-2.

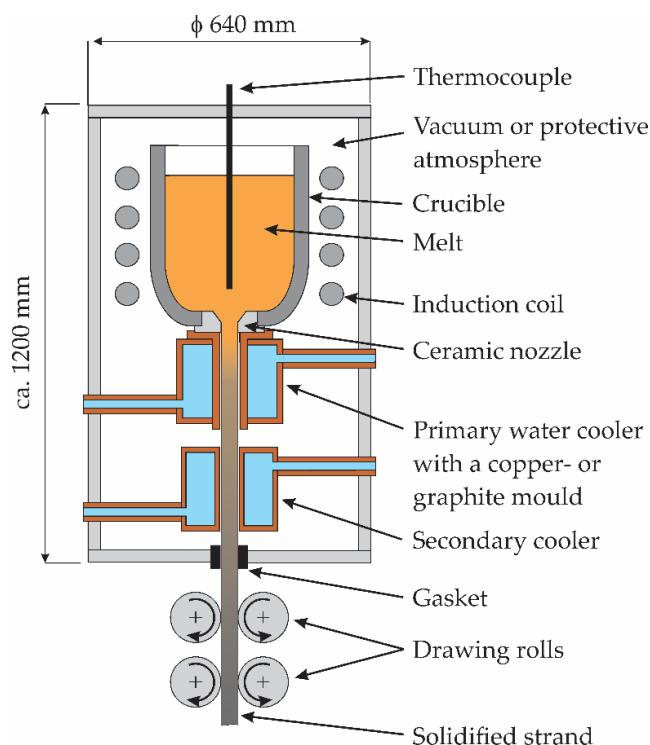


Figure S1-1. The vacuum-induction melting furnace with the vertical continuous caster—schematic drawing.



Figure S1-2. Vacuum induction-melting furnace; the continuous caster is placed below the furnace but cannot be seen.

Performances

Vacuum induction melting (VIM) furnace leibold hereaus

Inductor: 4 kHz, max. 60 kW

Maximal charge: 3000 cm³ (3 litres) of melt

Minimal charge: 1500 cm³ (1.5 litres) of melt

Melt temperature: max. 2000 °C

Melting and casting under vacuum or protective atmosphere

Vacuum: 5×10^{-1} mbar without continuous caster, 5×10^{-1} mbar with continuous caster

Alloying under a controlled atmosphere possible through the vacuum-antechamber

Sampling of melt under a controlled atmosphere possible through the vacuum antechamber

Vertical Continuous Casting (VCC) Device Technica Guss

Static mould: graphite or copper, additional ceramic inserts possible

Strand (round): $d_{\max} = 30$ mm

Strand (flat): up to 10 mm × 100 mm

Withdrawal:

(1) computer-controlled

(2) continuous drawing speed

(3) pulsating drawing speed

(4) pull-stop withdrawal sequence: Drawing stroke, stop1, reverse stroke, stop2. The length and the speed of both strokes and the duration of both stops are programmable; one or both stops and/or reverse stroke can be skipped.

(5) $v(t)$ -curve programmable.

Location

Faculty of Mechanical Engineering, University of Maribor, Smetanova ulica 17, 2000 Maribor, Slovenia.

Experiences

Different alloys were continuous-cast experimentally for scientific research and for customers from Europe (Slovenia, Switzerland, Italy, Great Britain...) and America (USA, Brasil). For example:

- (1) Copper and copper alloys (bronze alloys, brasses, precipitation-hardening alloys),
- (2) Aluminium alloys with quasicrystals,
- (3) Nickel-based superalloys Incoloy® and Inconel®,
- (4) Ni-Fe superalloy Nispan®,
- (5) Magnetic alloy Alnico®,
- (6) Thermo-couple-alloy Constantan®,
- (7) Cu-based shape memory alloys, etc.

Supplementary Information-S2

X-ray Diffractograms of Strands 2 and 3

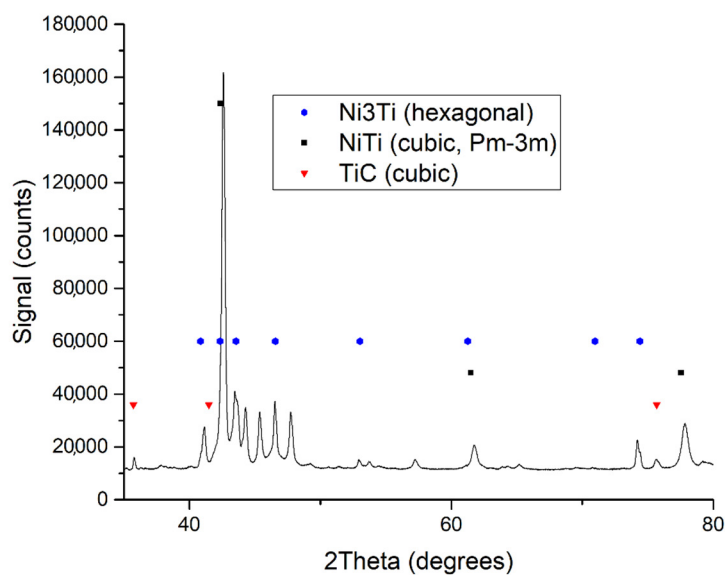


Figure S2-1. X-ray diffractogram of strand 2.

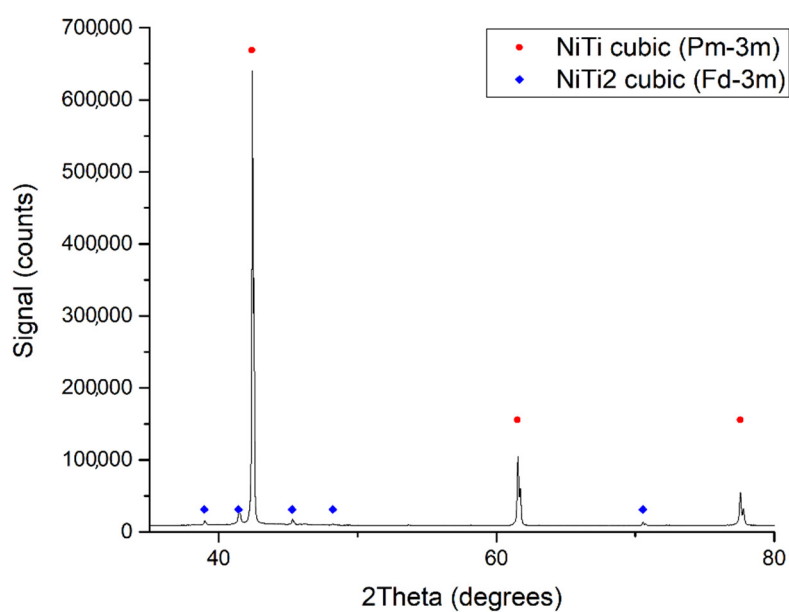


Figure S2-2. X-ray diffractogram of strand 3.

