

Development of post heat treatments for a hot extruded polycrystalline NiMnGa alloy

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Aim:

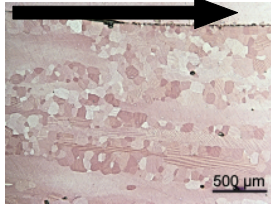
coarse grained and textured polycrystalline NiMnGa alloys
(nearest to single crystal → less pinning by grain boundaries)

Initial state

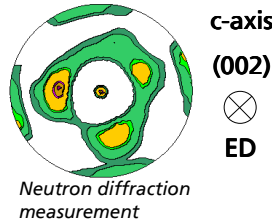
Material preparation:

1. conventional casting → 2. hot extrusion (1000 °C)

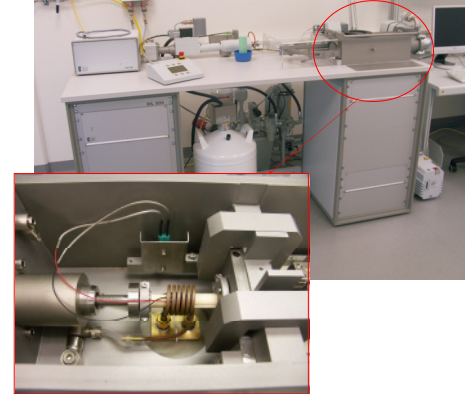
extrusion direction (ED)



- 5M martentite
- grain size: 100 µm
- preferred grain orientation along ED
- fiber texture along ED



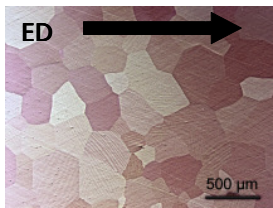
Experimental method:
thermal and thermo mechanical treatment using a deformation/quenching dilatometer



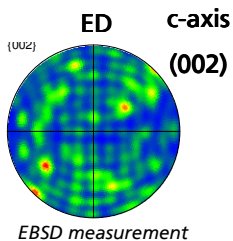
Results after post heat treatments:

Annealing without deformation:

→ best: 1000 °C; 60 min



grain size:
300 µm



no sharp orientation after annealing

→ grain growth
→ but less texture

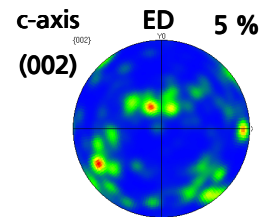
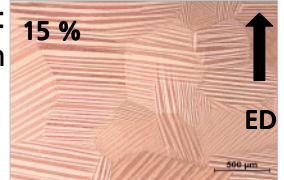
Annealing with short time deformation and hold force

(1000 °C, 60 min):

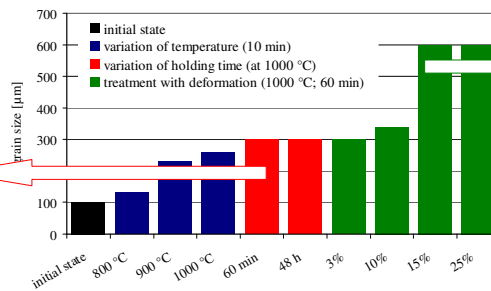
→ best grain size: 15 %

→ best orientation: 5 %

grain size:
600 µm



→ grain growth
→ strong texture



Annealing with short time deformation (1000 °C, 60 min):



one large grain of about **4 mm** and strong texture

Summary:

Coarse grained microstructure after post heat treatments with **short time deformation** and annealing without applied force

Next tasks:

- measurements in magnetic field
- improving mechanical behavior by using training
- optimize orientation by cutting

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MAGNETIC SHAPE MEMORY
A DFG PRIORITY PROGRAMME

Fraunhofer
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