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Texture Development in CuAlNiTi Shape Memory Alloys Subject to Different Thermo- Mechanical Processes.

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Abstract – In the present work 3 different processing routes were used in copper based shape memory alloys. The texture development in these alloys varies according with the selected route; the mechanical response is related with it. The pseudoelasticity and the recoverable strains were analyzed. Accordingly with the results a favorable way of processing can be selected.

Current copper based alloys are of great importance because of their shape memory and pseudoelasticity effects. A large part of the scientific investigation is focused in single crystals where the best performance can be obtained. However, single crystals are not always appropriated for industrial processing. In the current study, different copper-based shape-memory polycrystals were processed using three different techniques: Hot extrusion, twin roll casting and melt spinning.

The shape memory and pseudoelasticity effects are directly related to the martensitic transformation in Cu-Al-Ni-Ti alloys and to the single crystal orientation. Accordingly, the development of a favorable texture in the austenitic phase should improve the properties in the polycrystalline Cu-based alloys [1].

Texture measurements for the austenitic phase were performed using x-ray diffraction and EBSD. Melt spun ribbons of 50 μm thickness were measured by regular x ray diffraction and by a special tomographic technique designed for measuring thin films. As it is shown on figures 1 and 2, the textures resemble each other with the expected modifications due to the action of different velocity gradients and cooling rates.

Pseudoelasticity tests were performed for the different copper based shape memory alloys, finding variations on the mechanical response and percentage of recoverable strain. Those variations can be associated with the developed texture of the austenitic phase and, comparing experimental results and theoretical calculations, a favorable way of processing this material can be selected.

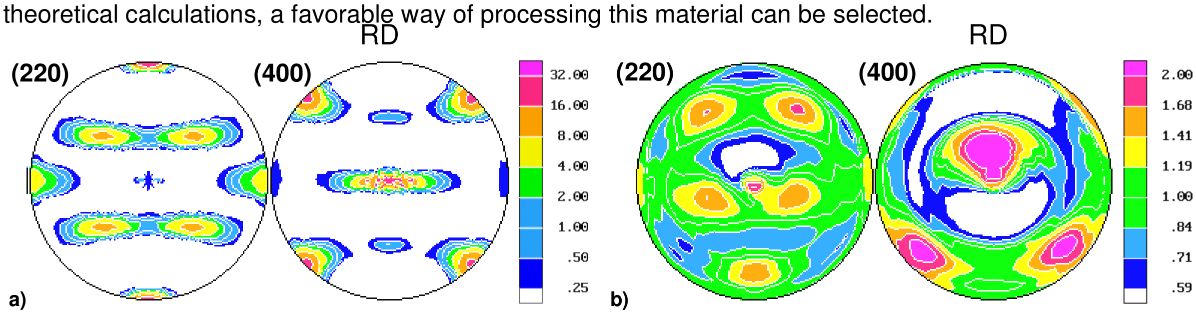

Figure 1: Pole figure measurements of austenite matrix by X-rays **a)** rectangular section hot extruded sample, **b) m**elt spun ribbon.

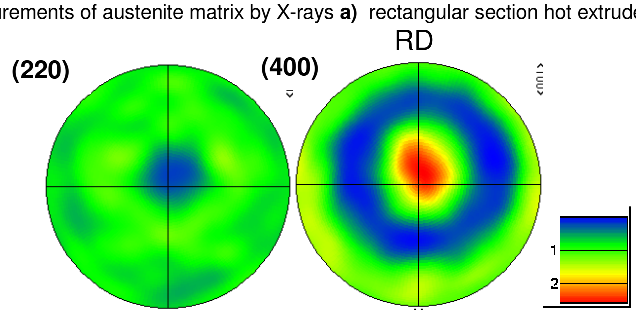

Figure 2: a) Pole figure measurement Twin roll casting strip, taken by EBSD

References

[1] Y.Sutou, T.Omori, K. Yamauchi, N. Ono, R. Kainuma, K. Ishida. Acta Materialia 53 (2005) 4121-4133.