

Reverted austenite in a 18Ni 350 Maraging steel: influence on magnetic properties and texture aspects.

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Abstract –

Maraging steel is a family of metallic materials with extremely high mechanical strength and good toughness [1]. When cold rolled and aged maraging steels can be used in high speed rotors. Aging treatments above 500°C, promote the formation of austenite by diffusion-controlled reaction. The amount of austenite formed at the aging temperature is totally or partially retained at room temperature, depending on its chemical composition. In this work, samples aged at temperatures above 550° C presented reverted austenite [2]. The partially reversion of austenite during aging in 350 Maraging steel was studied by optical microscope, x-ray diffraction and electron backscatter diffraction. The cooling of aged samples in liquid nitrogen was investigated. The austenite formed in between 500-600 °C is enriched with Ni (Table I). It is stable and do not transform to martensite at room temperature. When cooled in liquid nitrogen these Ni rich austenite transforms to martensite. The influence of reverted austenite on magnetic properties was investigated. The cooling in low temperature reduces the amount of reverted austenite and changes magnetic properties. The crystallographic texture of reverted austenite was analyzed by x-ray diffraction and ebsd. Measured results were compared with calculated one that was obtained by using the classical theory of martensite [3]. The texture of reverted austenite is the same of the parent austenite texture indicating that a phenomenon of austenite memory is present.

Table I- Composition of austenite x temperature (calculated with Thermocalc).

	Fe	Co	Ti	Ni	Mo
550° C	59.0	5.6	0.25	31.4	3.5
600° C	62.0	7.5	0.5	25.7	4.3
650° C	63.3	10.0	1.0	20.6	4.8
700° C	63.4	10.7	1.4	19.7	4.8

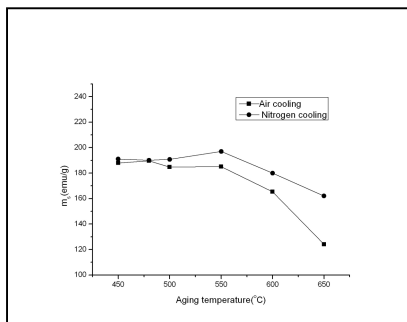


Figure 1: Magnetization saturation for samples cooled in air and liquid nitrogen.

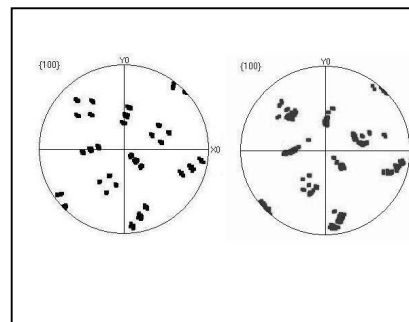


Figure 2: Calculated x measured pole figure for martensite assuming the classical theory of martensite.

References

- [1] Belozarov, E.V. Sagardaze, V.V. Popov, A.G. Pastukha, A.M; Pecherkin, N.L. The physics of metals and metallography, vol. 79. n° 6, 1995., pp 606-613.
 [2] Tavares, S.S.M., Abreu, H.F.G., Neto, J.M., Silva, M.R., Popa, I., J.M.M.M., 272–276 (2004) 785–787.
 [3] H. K. D. H. Bhadeshia. Geometry of Crystals. 2nd edition, Institute of Materials, 2001.