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Martensitic transformation of Fe-27%Ni alloy

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Abstract – Thermomechanical treatments were done in Fe-27%Ni alloy, consisting of an hot rolling at 1100ºC with 55% thickness reduction following by a thermal treatment at two different dwell temperatures (800ºC and 1100ºC) for 60 minutes, were liquid nitrogen quenched. Simulated results, based on the files from EBDS data, showed that some values found (0 -4 1)[-1 1 4], (-2 -6 1)[-1 1 4] e (5 1 1)[-1 -2 7] - 60° for twin boundaries in parent phase and (0 0 1)[-1 1 0] e (-1 -1 -1)[1 1 2] for twin boundaries in parent phase present in this work.

They are known for not being time dependent to start or proceed its process. Many factors such as crystallography of parent phase, heat treatment temperature and chemical composition affect considerably martensitic transformation and martensite morphology as well as they are responsible for development of crystallography components with respect to the variants selection during the transformation.

During the austenite to martensite phase transformation varying numbers of product martensite grains with different crystallographic orientations can be obtained from one single austenite parent grain. The orientations of the product martensite crystals are connected to the parent austenite orientation with exact crystallographic orientation relations, which can be expressed either by a specific axis angle pair or by indicating the corresponding lattice planes and directions of the parent and product crystals. In steels the most frequently observed crystallographic orientation relations are the ones proposed by Kurdjumov-Sachs (K-S) and Nishiyama –Wasserman (N-W) and twin boundaries in parent and product phase.

Not all of the theoretically possible product orientations, predicted by these crystallographic transformation laws, are experimentally observed. Very often only a few selected product orientations appear in the transformed structures.

The aim of this study was to revisit martensitic transformation and orientation relations proposed for martensitic transformation measured by EBSD technique seeking to investigate experimental and theoretically. In order to obtain two analysis conditions, thermomechanical treatments were done in Fe-27%Ni alloy, consisting of an hot rolling at 1100ºC with 55% thickness reduction following by a thermal treatment at two different dwell temperatures (800ºC and 1100ºC) for 60 minutes, were liquid nitrogen quenched. Simulated results, based on the files from EBDS data, showed that some values found (0 -4 1)[-1 1 4], (-2 -6 1)[-1 1 4] e (5 1 1)[-1 -2 7] - 60° for twin boundaries in parent phase and (0 0 1)[-1 1 0] e (-1 -1 -1)[1 1 2] for twin boundaries in parent phase.

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