Nanocomposites and nanomaterials

Nanocrystalline structure of Fe-31wt.%Ni alloy

V.E. Danilchenko

G.V. Kurdyumov Institute for Metal Physics, NAS of Ukraine, Vernadsky Blvd. 36, Kyiv 03142, Ukraine.
E-mail: danila@imp.kiev.ua

New scientific results relatively the effect of cyclic -- martensitic transformations on the structure state of reverted austenite of Fe-31wt.%Ni alloy are presented. The effect of the direct -- and the reverse -- multiple martensitic transformations on fragmentation of austenitic grains has been investigated by electron-microscopy and X-ray diffraction methods. Ultra-fine structure has been formed by means of nanofragmentation processes inside the initial austenite grains due to the successive misorientation of their crystal lattice. As a result of multiple -- martensitic transformations the austenite structure was nanofragmented. The -- transformations increasing number leads to a rising misorientation angle between austenite subgrains and to a converting of the austenitic single crystal into a textured polycrystal. It has been shown that the multiple -- martensitic transformations lead to a change of the mechanism of internal stress relaxation: from the dislocation-based mechanism to deformation twinning.

The ratio of the reverted austenite dispersity degree with mechanism of reverse martensitic - transformation is analyzed. The conditions of structure refinement up to ultra-dispersed and nanocrystalline levels as a result of both shear and diffusion characters of reverse - transformation are determined.