REDISTRIBUTION OF MICROSTRESSES IN SHEETS FROM Zr-BASED ALLOYS UNDER ANNEALING

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Changes of the residual microstress distribution in cold-rolled sheets (ε=55%) from Zr-based alloys under recrystallization annealing were studied by the X-ray method of Generalized Pole Figures, showing an anisotropy of α-Zr substructure condition along basal axes of HCP crystalline lattice in the space of coordinate axes RD, TD and ND (rolling, transverse and normal directions, correspondingly). Sheets of commercial alloys Zr-1%Nb and Zr-2,5%Nb, obtained by plain rolling and transverse rolling, differ sharply in their crystallographic texture. However, the distribution of spacing c(ψ,φ) between basal planes (0001) in rolled sheets retains some kind of memory about the used deformation scheme, such as division of the texture Pole Figure into two parts, separated by diameter TD-ND-TD and characterized by predominant increase or decrease of parameter c relative to its average value, indicating to operation of residual elastic microstrains.

The deformed condition of α-Zr is characterized by distortion of shape of the unit cell, so that due to an excessive content of defects in HCP crystalline lattice its parameter a increases and parameter c decreases. These changes of lattice parameters can be separated from changes, connected with residual microstresses, by asymmetry of their distribution. Recrystallization annealing 580^{o}C/3 h. changes the rolling texture of α-Zr, but does not remove elastic microstrains, though such removal could be awaited in accordance with the widespread opinion. However, the distribution c(ψ,φ) looses its initial connection with the deformation scheme and becomes axial about ND, so that at the angular distance 40^{o}-50^{o} from ND compressive microstresses along axes <0001> in α-Zr grains turn into tensile ones. As a result of annealing, due to decrease in the content of defects the unit cell of deformed α-Zr returns to its initial shape and size, but nevertheless recrystallized sheets show rather wide distributions of lattice parameters, conditioned by operation of elastic microstresses.

Features of the microstress distribution in annealed sheets and tubes from Zr-based alloys are compared.