Investigation of texture inhomogeneity in magnesium alloy MA2-1 after equal channel angular pressing (ECAP)


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We investigated the texture inhomogeneity formed after equal channel angular pressing (ECAP) for Mg-4.5%Al-1%Zn (MA2-1) alloy [1]. The bar extruded with backpressure at 345°C was input for ECAP. The ECAP was carried out up to four passes following the routes A (a sample orientation is not changed after each pass), C (after each pass a sample is rotated about its longitudinal direction by 180°) and up to six passes following the route Bc (after the first two passes under the route C a sample is rotated about its longitudinal axis by 90° clockwise, then remaining two passes are achieved again under the route C). During the first part of the experiment the texture gradient of the four samples cut from MA2-1 alloy bar has been measured.

Figure 1: The experimental pole figures measured by hard X-rays at DORIS, W2 (DESY) for the input sample and the samples in the route A of ECAP. The all samples are from alloy MA2-1. The extrusion direction (ED) is in the center for the all PFs. The position of the sample coordinate system (extrusion direction, transverse direction, normal direction) is the same for the all samples.
Figure 2: The experimental pole figures measured by hard X-rays at DORIS, W2 (DESY) for the input sample and the samples in the route C of ECAP. The all samples are from alloy MA2-1. The extrusion direction (ED) is in the center for the all PFs. The position of the sample coordinate system (extrusion direction, transverse direction, normal direction) is the same for the all samples.

In the Figures 1-2 the pole figures received from the set of Laue patterns for the middle layers of the MA2-1 alloy samples are presented. In our previous studies the measurements of the global texture for these samples have been done by means of neutron diffraction using the TEX-2 diffractometer at the FRG-1 neutron source (HZG) [2]. As well as for the global neutron texture experiment the initial texture (for the input sample) measured by the hard X-rays in the each of the investigated layers is characterized by two strong axial components (basal and prismatic). After the first pass we observe the moving of the basal component (the intensity maximum) on the angle about 45° respectively to the extrusion direction.

So we can state the good qualitative agreement between the neutron and the hard X-rays pole figures for all measured samples.

References