НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ТОМСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ
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ИНСТИТУТ ПРОБЛЕМ ХИМИКО-ЭНЕРГЕТИЧЕСКИХ ТЕХНОЛОГИЙ СО РАН
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ВЫСОКОЭНЕРГЕТИЧЕСКИЕ И СПЕЦИАЛЬНЫЕ МАТЕРИАЛЫ: ДЕМИЛИТАРИЗАЦИЯ, АНТИТЕРРОРИЗМ И ГРАЖДАНСКОЕ ПРИМЕНЕНИЕ

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MECHANICAL PROPERTIES OF MICROSTRUCTURED MAGNESIUM ALLOY, OBTAINED BY SEVERE PLASTIC DEFORMATION

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In present research, the mechanical properties of a sheet microstructured magnesium alloy of the Mg-Mn-Ce system obtained by the methods of intense plastic deformation were investigated. Modification of the coarse-grained structure of light alloys to an ultrafine-grained state is necessary for improving physico-mechanical properties [1, 2]. The use of widely developed processing techniques, such as equal-channel angular pressing and torsion under pressure, is unacceptable for sheet metal samples because of their shape. As alternative to these methods of processing can be new techniques, in particular, groove pressing with subsequent straightening. (GP) In this method, flat samples, cut from sheet metal, are pressed between two grooved parts of the mold, at the same time, large degrees of plastic deformation are realized in the local regions of the sample due to shear. One pressing cycle consists of the following sequences of actions: grooving; straightening ; sample displacement; repeated grooving; straightening. It is assumed that one cycle promotes uniform sample processing. To determine the degree of deformation during the processing of sheet metal by the GP method, a numerical calculation by the finite element method was carried out. Based on the calculation data, an experiment was performed and microstructured samples of magnesium alloy were obtained. A series of mechanical tests and a study of the microstructure were carried out after obtaining the samples. It was found that plastic deformation to 3.48 leads to the formation in the sample of a microstructure with a lognormal distribution of grain sizes lying in the range 0.5 to 8 μm. It was found that microstructural changes affect significantly to the mechanical behavior of the material at axial tension testing. Yield strength and tensile strength increased significantly. The possibility of inhomogeneous deformation is slightly increased due to an increasing of the limiting strain before fracture.

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