

The Effect of Vibromilling Powder Substructure on Mechanical Properties of High-carbon Steels

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Abstract

The effect of pure iron powder vibromilling duration on the fine structure parameters as well as the behaviour of these characteristics under reduction of the above powder are studied. It is shown that vibromilling is followed by intensive formation of dislocations, a sharp increase of their density and a level of mean-square deformations and a decrease of the unit value. Processes of recovery and polygonization proceed intensely during heating (reduction) of powders, but despite this, defects in crystalline structure of metals remain high. Initial temperature and rate of diffusion processes sharply vary as dependent on parameters of the alloy fine structure.

Powder high-carbon drop-stamped steels with hereditary fine-crystalline structure produced on the base of pure iron powders made by vibrogrinding are studied for certain mechanical-and-physical characteristics (density, strength, hardness,, ductility and fracture toughness). Fixing of polygonized dislocation substructure of the metal on the-base of such powders by segregated atoms of carbon permits essentially increasing mechanical properties and supporting ability of carbon steels as well as realizing the effect of thermomechanical hardening of alloys by the methods of powder metallurgy.