

Tailoring the gradient ultrafine-grained structure in low-carbon steel during drawing with shear

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Abstract

© 2016, Faculty of Metallurgy. All rights reserved. Conventional drawing and drawing with shear were conducted on the rods of low-carbon steel. Deformation by simple drawing forms basically a homogenous structure and leads to a uniform change in microhardness along the billet volume. A comparative analysis of the models of these processes showed that shear drawing of steel at room temperature reduces energy characteristics in half, normal forces on the die – by 1,8, and enhances the strain intensity from 0,5 to 1,6. During drawing with shear, strain-induced cementite dissolution occurs and a gradient structure is formed, which increases the microhardness of the surface layer up to values close to 7 000 MPa.

Keywords

Drawing with shear, Gradient structure, Low-carbon steel, Severe plastic deformation