

MECHANICAL PROPERTIES OF SUBMICROCRYSTALLINE 0.19%C LOW CARBON STEEL AFTER EQUAL CHANNEL ANGULAR PRESSING AND HEATING

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Abstract

The purpose of the work was to study the structure and properties of the 0.19%C steel after equal-channel angular pressing (ECAP) and subsequent heating. The ECA pressing of the 0.19%C steel at 400°C for 4, 8, and 12 passes at an angle of 120° between the channels led to the formation of the grain-subgrain structure with a ferrite structure element size of about 350 nm. Heating of the steel after ECA pressing to 400 and 450°C increases the fraction of high-angle boundaries, and the ferrite structure element size rises to 360–450 nm. The obtained grain-subgrain submicron-size structure provides a substantial strengthening (YS = 730 –790 MPa) at a sufficient plasticity (EL = 11.0–15.3%). After ECAP and heating, the strength do not virtually change, but the ductility somewhat rises. The impact toughness after ECAP decreases, but remains at a high level.

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