

DOI: 10.17223/9785946218412/236

EFFECT OF WARM ROLLING ON GRAIN REFINEMENT AND MECHANICAL PROPERTIES OF AUSTENITIC STAINLESS STEEL

Odnobokova M., Belyakov A., Fedoseeva A., Kaibyshev R.

Belgorod National Research University, Belgorod, Russia

The deformation microstructures of a 316L - type austenitic stainless steel subjected to warm plate rolling at temperature of 300°C to different total true strains (ϵ) of 0.5, 1, 2 or 3 and their effect on the mechanical properties were studied. The dislocation density rapidly increases above 10^{15} m^{-2} at early warm deformation ($\epsilon \approx 0.5$). The warm rolling was accompanied by grain refinement after straining to $\epsilon > 0.5$. The grain refinement was associated with development of deformation twinning and microshear banding which contribute to the appearance of ultrafine grains with size of less than 1 μm . The fraction of ultrafine grains after warm rolling to different total true strains was expressed using a modified Johnson-Mehl-Avrami-Kolmogorov equation. The grain refinement leads to significant strengthening as a result the yield strength approached 1080 MPa after warm rolling to a total strain of 3.

Acknowledgment. The study was financially supported by President Grant for young scientists (grant number 075-15-2019-1165).