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VIII ВСЕРОССИЙСКАЯ НАУЧНО-ПРАКТИЧЕСКАЯ КОНФЕРЕНЦИЯ С МЕЖДУНАРОДНЫМ УЧАСТИЕМ, ПОСВЯЩЕННАЯ 50-ЛЕТИЮ ОСНОВАНИЯ ИНСТИТУТА ХИМИИ НЕФТИ

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EFFECT OF HEAT TREATMENT ON STRUCTURE AND MECHANICAL PROPERTIES OF 12Cr-3Co STEEL WITH LOW N AND HIGH B CONTENTS

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The effect of heat treatment on the microstructure and mechanical properties of Fe_{bal}-0.1 wt.%C-12Cr-3Co-2.5W-1Cu-VNbTaBN steel was investigated. After normalization in the range of 1050-1150°C, the martensitic structure was dominant; δ-ferrite content was about 10%. When temperature of normalizing increased from 1050C to 1150°C, the average size of prior austenite grains increased from 44 to 68 μm. After tempering at 750, 770 and 800°C, tempered martensitic lath structure with a high dislocation density within martensitic laths contained nanosized $M_{23}C_6$ carbides along the boundaries of prior austenite grains and laths and (Ta,Nb)X carbonitrides randomly distributed in the ferritic matrix. The average sizes of $M_{23}C_6$ carbides and (Ta,Nb)X carbonitrides were 50 nm and 40 nm, respectively, independently of tempering temperature. The M_6C carbide particles were also observed along the boundaries of prior austenite grains and pockets as well as along the boundaries between δ-ferrite and martensite; their amount was negligible. When tempering temperature increased from 750 to 800°C, the particle density on the boundaries between δ-ferrite/martensite decreased from 3.8 to 0.2 μm^{-1}. A relationship between the lath size (h) and the density of free dislocations (ρ) obeyed:

$$h = 5.41\rho^{-0.5} - 0.07$$

Increasing the tempering temperature to 800°C led to a decrease in the hardness up to ~220 HB, yield stress and ultimate tensile stress up to 520 and 700 MPa, respectively.

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