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Microstructure and mechanical properties of a low C medium Mn heavy plate steel

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Advanced heavy steel plates with combination of high strength and superior low-temperature toughness are preferred as constructural materials for ship hull, bridges, buildings, pressure vessels, and offshore structures. The medium Mn steels containing 5-8 wt.% Mn are thought to have great potential. The microstructure and mechanical properties of a 0.07C-5.5 wt.% Mn steel subjected to quenching and intercritically tempering was studied. The slab of 230 mm thickness was hot rolled to 50 mm plate with the start rolling and finish rolling temperature of 1050°C and 930°C, respectively. The plate was directly water quenched to a temperature between Ms and M_f of 380°C, and then cooled slowly to room temperature in a delayed cooling pit. The quenched plate was tempered at 630°C for 80 min and 650°C for 40 min respectively. The microstructure of quenched steel consisted of martensite and retained austenite. The yield strength, tensile strength, and elongation was 805 MPa, 1114 MPa, and 16.7%, respectively. The impact energy at 20°C and -20°C was 207J and 150J. The reverse transformed austenite formed during intercritically tempering. The yield strength and tensile strength of 650°C tempered speciemens were decreased to 650 MPa and 829 MPa. The elongation was increased to 26.2%. The impact energy at 20°C and -20°C was 223 J and 157 J. When the tempering temperature was 630°C, the yield strength, tensile strength, and elongation was 648 MPa, 824 MPa, and 24.6%, respectively. The impact energy at 20°C and -20°C was greatly enhanced to 239 J and 207 J. The change of mechanical properties was attributed to the volume fraction and stability of austenite.

Biography

Lin-Xiu Du has completed his PhD from State Key Laboratory of Rolling and Automation, Northeastern University. He is the Director of the "Metal material microstructure and performance control team". He has published more than 15 papers in reputed journals and has been serving as an Editorial Board Member of repute.

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