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A low-C 5-Mn ultra-heavy plate steel with high microstructural homogeneity and excellent strength-toughness combination

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Ultra-low carbon 5Mn steel was subjected to control rolling and direct cooling, and then the ultra heavy plate steel of 100 mm thickness was intercritically tempered at 650°C. The microstructure consisted of alternative laminate structure of tempered martensite and reversed transformed austenite. The yield strength, tensile strength, and elongation of 638 MPa, 805 MPa, and 34%, was obtained in the 1/2 thickness of the plate, and 670 MPa, 818 MPa, and 32% in the 1/4 thickness. Moreover, the impact absorbed energy tested at -80°C was higher than 100 J. The high microstructure and mechanical properties homogeneity along thickness was obtained because 5Mn alloying significantly increase the hardenability of the ultra-thick plate steel. The partitioning of Mn from tempered martensite to austenite greatly enhanced the stability of reversed austenite. Austenite transformed to martensite under tensile straining, and the volume fraction decreased gradually. The TRIP effect of metastable reversed transformed austenite played the significant role on improving toughness and plasticity.

Biography

Jun Hu has completed his PhD from The State Key Laboratory of Rolling and Automation, Northeastern University. He is dedicated to study the microstructural evolution and mechanical properties control of advanced high strength steel. He has published more than 20 papers in the SCI indexed journals.

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