

Investigation on the Effect of finish rolling temperature on microstructure and mechanical properties of API X70 steel

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ABSTRACT

Development of industries in recent years, reveals the essential need to the microalloyed steels with high strength and good ductility. The only effective method that has lower cost to spontaneous reinforcing strength and toughness in this type of steels is refinement of the Ferrite grains by thermomechanical Treatment. API X70 steel belongs to high strength microalloyed steel group. It has a high mechanical strength based on API-5L standard and is regarded as a main steel in manufacturing of gas and oil pipes. The manufacturing process of this steel is the controlled rolling, which is a kind of thermomechanical treatment and it is considered as a grain refining methods. In this research, in order to investigate the Effect of finish rolling temperature on microstructure and mechanical properties of API X70 steel, three specimens of the steel were rolled experimentally. Rolling operations are designed in such a way that the rolling of the specimens finished at 846, 823 and 800 °C. Results of the experiments analyzed by mechanical tests and microstructures observations. The microstructure observations show that decreasing of finish rolling temperature causes decrease in Ferrite grain size. Results also show that rolling of API X70 steel in the vicinity of the A_{r3} temperature causes non-homogeneous in microstructure. This is due to Strain-Induced Transformation. On the other side, Tensile and impact tests show that decreasing of finishing rolling temperature causes increasing yield and tensile strength and also improves the toughness.

KEYWORDS

API X70 steel, Finish Rolling Temperature, Thermomechanical Treatment, Microstructure, Mechanical Properties.