

Production of ultra-fine grain API X70 steel with thermomechanical treatment

Abstract

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 gas and oil pipes. The manufacturing process of this steel is controlled rolling. In the present study the essential conditions for reaching an ultra-fine grain microstructure of API X70 steel by thermomechanical treatment is examined. by hot compression test, deformation in 3 areas of recrystallization, non-recrystallization and $\alpha+\gamma$ dual phase are all programmed. Results of the experiments analyzed by flow curves obtained from mechanical tests and microstructures observations. Results show that in temperature ranges below A_{r3} and high strain rates, microstructure includes ultra-fine Ferrite grains. It's due to transformation of work hardened austenite to ferrite.

Keywords: ultra-fine grain steel, API X70, thermomechanical treatment, flow curves.