GRAIN REFINEMENT DURING SEAMLESS TUBES HOT ROLLING OF V-N STEELS

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Abstract
The goal of this work is to discuss the main metallurgical aspects involved in seamless tubes hot rolling of V-N steels. Two processing routes were considered here: direct and cold charging. In order to evaluate the microstructural differences caused by these two routes, hot torsion simulation was employed. The industrial termomechanical cycles were characterized and simplified due to machine limitations. Simulations were conducted in a computer controlled servo-hydraulic machine equipped with a radiant furnace. Samples for optical microscopy and transmission electronic microscopy were obtained by interruption of process simulation after selected steps. Industrial scale tests also were conducted in order to evaluate mechanical properties for these two routes. It was observed in these industrial tests that cold charging can promote a ferrite grain refinement and, consequently, an increase in yield strength and impact toughness. The evolution of microstructure and precipitation observed during simulation helped to understand the results found industrially.

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