Effect of Temperature during Hot Deformation on the Electrochemical Behavior of HSLA Pipeline Steels

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The hot deformation behavior and corrosion properties of HSLA steels under compression processes were studied. In this paper, the hot compression tests were conducted at a deformation temperature of 800 and 1100°C with strain rates of 0.1, 1 and 10 s⁻¹ using an MMS-200 thermal-mechanical simulator. The true stress-strain curves under different conditions were obtained. The flow stress increases with the increase of strain rate and decreasing deformation temperature. The microstructure, hardness, and electrochemical properties of the specimens were investigated to discover/understand the effect of the deformation temperature on specimens. Microstructure observation shows that the grain size increased with an increase of deformation temperature, and fine AF grains were observed in specimens, which had direct effects on the resulting hardness, leading to the highest hardness values. From the final, optimized hot deformation process, the specimens deformed at the temperature of 800°C and the strain rate of 0.1 s⁻¹ had a completely recrystallized and homogeneous grain structure and could be improved by corrosion resistance better than the as-cast specimens.

Keywords: high-strength low-alloy, hot compression test, ferrite, strain rate, deformation temperature

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