

Hot Deformation and Processing Maps of a High Strength Alloy Steel

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Abstract. The hot deformation behaviors of a high strength low alloy steel have been studied using the processing map technique. Compression tests were carried out at the temperatures from 850 to 1150 °C and strain rates from 0.01 to 50 s⁻¹ on Gleeble-1500 thermo-simulation machine. Processing maps for hot working are developed on the basis of the variations of efficiency of power dissipation with forming temperatures and strain rates. The results show that: (1) The average grain size of the deformed the studied alloy steel increases with the increase of forming temperatures and decreases with the increase of strain rates. (2) Within the studied experimental conditions, the efficiency of power dissipation increases as the forming temperature is increased. However, the efficiency of power dissipation changes with strain rates in the form of bulgy parabola, and the maximum value exists at the strain rate of 0.1 s⁻¹. (3) A domain for reasonable dynamic recrystallization (DRX) exists in the temperature range of (1050–1150) °C and strain rate range of (0.01–3) s⁻¹, with its peak efficiency of 32% at about 1140 °C and 0.23 s⁻¹, which are the optimum hot working parameters for the studied high strength low alloy steel.