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**PROCEEDINGS**

# Test and Simulation Researches on G550 Cold-Formed Steel at High Temperature and High Strain Rate

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**ABSTRACT**

The tests of dynamic mechanical properties of materials at high temperature and high strain rate has always been a difficult issue [1]. In order to perform the dynamic mechanical properties of G550 cold-formed steel at high temperature and high strain rate, a set of Hopkinson Tension test device which can synchronize with high temperature control is developed for material test [2]. The stress-strain curves obtained from the tests were used to explore the influence of temperature and strain rate on the rheological properties of material by combining micro-analysis. The results show that G550 cold-formed steel has obvious strain rate hardening effect and temperature softening effect, and the influence of temperature on its rheological properties is greater than that of strain rate. Therefore, a modified Johnson-Cook constitutive model for G550 cold-formed steel is proposed based on the variation of temperature softening coefficient [3]. In order to verify the correctness of the constitutive model, a numerical high-temperature dynamic tensile test model was established. The modified Johnson-Cook constitutive model was written into a UMAT subprogram in Fortran language and assigned to the high-temperature dynamic tensile sample. Then, output the stress-strain curves in the post-processing results. Through mutual verification of simulation results and experimental data, it is found that the constitutive model can well describe the dynamic mechanical behavior of G550 cold-formed steel at high temperatures and high strain rates, and can provide references for finite element simulation of G550 cold-formed steel in high temperature, explosion and impact related fields.

**KEYWORDS**

Constitutive model; micro-analysis; rheological propertie; high strain rate; high temperature

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