

The Study on Plastic Flow Behavior and Constitutive Model of H96 Brass Alloy Under Compression

Junhang Guo, Yujie Sun, Qi Liu

Northwest Institute of Mechanical and Electrical Engineering, No.5, Biyuan East Road, Xian Yang, 712099, People's Republic of China

Abstract. The plastic behavior of H96 brass alloy under a wide range of temperatures ranging from 20°C to 600°C and strain rates ranging from 0.01 s⁻¹ to 6300 s⁻¹ was studied by Gleeble-3500 simulator and split Hopkinson bar test. The results show that the flow stress increases with the strain and strain rate, while decreases with the temperature. The flow behavior is modeled by Johnson-Cook model and the parameters were obtained by regressions.

Keywords: H96 brass; Dynamic compression; Flow stress; Constitutive model

1. Experiments



Figure 1. The H96 brass samples and test equipment

2. Results and discussion

a) For JC model : $\sigma_y = (A + B\varepsilon^n)(1 + C \ln \dot{\varepsilon}^*) (1 - T^{*m})$,

$A = 154.5 \text{ MPa}$, $B = 355.0 \text{ MPa}$, $n = 0.4515$, $C = 0.0765$, $m = 1.125$, $\dot{\varepsilon} = 14.47 \text{ s}^{-1}$.

b) For modified JC model : $\sigma_y = (A + B\varepsilon^n) \left(1 + \left(\frac{\dot{\varepsilon}}{C} \right)^{1/p} \right) (1 - T^{*m})$

$A = 60.4 \text{ MPa}$, $B = 330.5 \text{ MPa}$, $n = 0.311$, $C = 2.84 \times 10^4 \text{ s}^{-1}$, $m = 1.152$, $p = 3.3546$

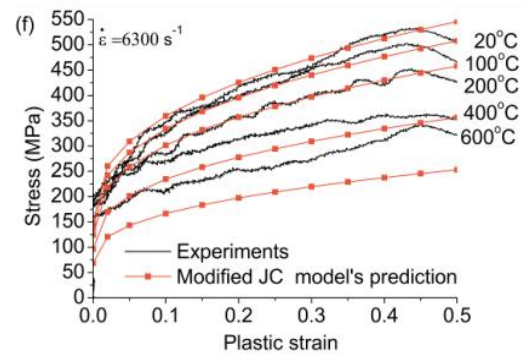
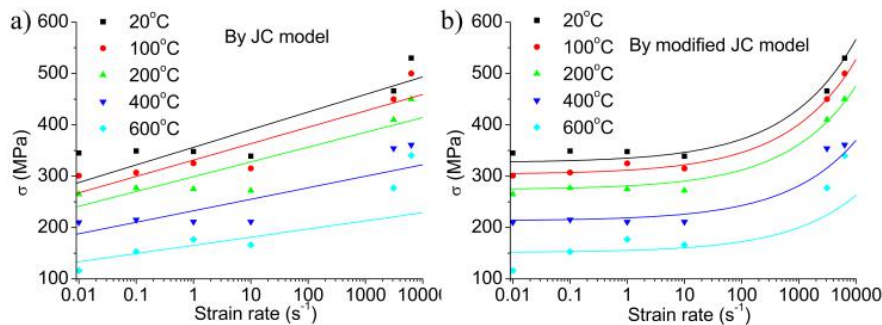
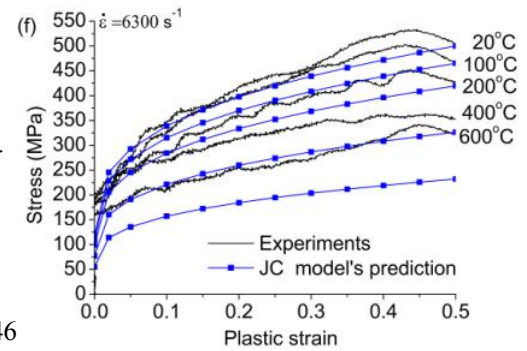


Figure 2. The influence of strain rate upon flow stress at given temperatures and strain

3. Conclusions

- 1) The experimental results show that the flow stress increased with strain indicating strain hardening. The flow stress increased with strain rate and decreased with temperature at given strain.
- 2) The related coefficients are obtained and the results show that the modified JC model with a Cowper-Symonds term is more suitable for H96 brass.