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A physically-based constitutive modelling of a high strength aluminum alloy at hot working conditions

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1 **A physically-based constitutive modelling of a high strength aluminum alloy at**  
2 **hot working conditions**

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12 **Abstract:** The hot deformation behavior of a high strength aluminum alloy  
13 (Al-Zn-Mg-Cu) was studied by isothermal hot compression tests performed over a  
14 range of temperatures (350~490 °C) and strain rates (0.001~1 s<sup>-1</sup>). A constitutive  
15 equation was established using experimental results to predict the flow stress of the  
16 alloy under elevated temperature. In the work hardening-dynamic recovery regime, a  
17 physically-based constitutive equation for the flow stress was obtained from the  
18 stress-dislocation relation. In the subsequent dynamic recrystallization region, the  
19 flow stress after the peak was predicted by employing the kinematics of the dynamic  
20 recrystallization in the constitutive model. The stress-strain curves of the alloy  
21 predicted by the established models were in good agreement with experimental results.  
22 The results indicate that the proposed physically-based constitutive equation can  
23 accurately predict the flow behavior of the Al-Zn-Mg-Cu alloy.

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