World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:9, No:03, 2015

Determination of Material Constants and Zener-Hollomon Parameter of AA2017 Aluminium Alloy under Hot Compression Test

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Abstract : The formability of metals depends on a number of variables such as strain, strain rate, and temperature. Though most of the metals are formable at room temperature, few are not. To evaluate the workability of such metals at elevated temperatures, thermomechanical experiments should be carried out to find out the forming temperatures and strain rates. Though a number of constitutive relations are available to correlate the material parameters and the corresponding formability at elevated temperatures, the constitutive rule proposed by Arrhenius has been used in this work. Thus, in the present work, the material constants such as A (constant), α (stress multiplier), β (constant), and n (stress exponent) of AA 2017 has been found by conducting a series of hot compression tests at different temperatures such as 400°C, 450°C, 500°C, and 550°C and at different strain rates such as 0.16, 0.18, and 0.2. True stress (σt), true strains (εt) deformation activation energy (Q), and the Zener-Hollomon parameter (Z value) were also calculated. The results indicate that the value of ln (Z) decreases as the temperature increases and it increases as the strain rate increases.

Keywords : hot compression test, aluminium alloy, flow stress, activation energy
Conference Title : ICIME 2015 : International Conference on Industrial and Mechanical Engineering
Conference Location : London, United Kingdom
Conference Dates : March 14-15, 2015