عنوان مقاله:

The Comprehensive Study on the Classical Constitutive Models in Predicting the Hot Deformation Behavior of Al5083-SiC Metal Matrix Composite

نویسندگان:

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خلاصه مقاله:

The main goal of this research is to study the hot deformation process of metal-matrix composites and investigate the possibility of using classical constitutive models to calculate the flow stress of such composites during the hot deformation process. A 5083 aluminum-based metal composite reinforced with 9 wt.% of 37 micron SiC particles, and made by stir-casting method, was used for the study. Standard and improved Johnson-Cook model, Arrhenius and Zerilli-Armstrong models in the temperature range of 673-823 K, and strain rates of 0.001-1 s-1 were extracted and their accuracy was studied. Based on the results, classical models used to predict the hot deformation behavior of metal alloys can also be used to predict the behavior of aluminum-matrix composites with reasonable accuracy depending on the type of model. The hot deformation activation energy Q for the composite based on the hyperbolic-sine law Arrhenius equation, is 265.5 kJ/mol. The strain-compensated Arrhenius model was the best model to predict the behavior of the composite with the error less than 7% and can reasonably predict the trend of changing the flow stress even at high temperatures with the correlation factor of 0.989.

کلمات کلیدی:

Metal matrix composite, Hot deformation, constitutive equation, Arrhenius model, Johnson-Cook model, Zerilli-Armstrong