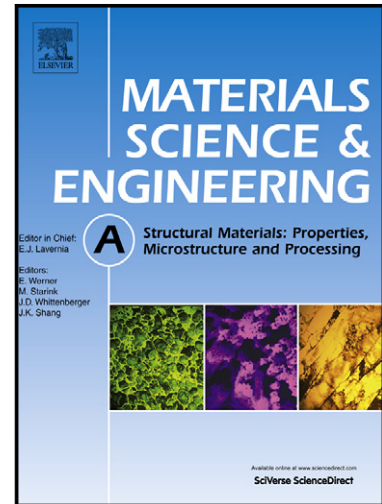


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The temperature and stress dependent primary creep of CP-Ti at low and intermediate temperature

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Abstract: The low and intermediate temperature creep of CP-Ti was systematically investigated by sequent load creep experiments and constant load creep experiments. It was found that significant creep appeared under the control of threshold stress and temperature limit, and only primary creep stage was observed. Based on the temperature and stress dependence of the creep behavior, a low and intermediate temperature deformation region map of CP-Ti was constructed, which could identify different deformation features. Moreover, the correlation between metallographic observation of twinning structures and the temperature dependent creep behavior was discussed. Different constitutive models were examined for the description of the low and intermediate temperature creep behavior of CP-Ti, and the power law primary creep constitutive model was proved to well describe the creep behavior of CP-Ti at all creep regions. Since the variations of the constitutive parameters with temperature were different at different creep regions, the partition method was introduced into the correlation equation of constitutive parameters with temperature and stress. At last, the constitutive model composed of the power law primary creep constitutive model and the partition method correlation equation was developed to describe the low and intermediate temperature primary creep behavior of CP-Ti at all creep regions.

Key words: primary creep, CP-Ti, constitutive model, temperature dependent

1. Introduction

Creep strain is dangerous for the safe operation of structures. High temperature creep has been widely investigated, and the high temperature creep behavior characteristics and constitutive models are clearly known [1-3]. On the other hand, various materials also creep at low and intermediate temperatures, such as CP-Ti [4-6], Zn [7], Ti alloy [8-9], Cu [10], steel [11-12] and Mg alloy [13]. The low temperature creep manifests primary creep stage. When the primary creep strain is significant, it will also endanger the safe and effective operation of structures, such as the low temperature creep of

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