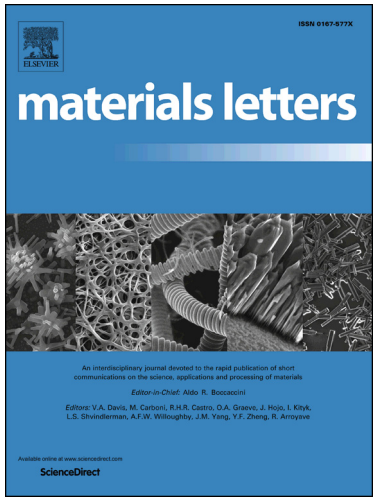


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# Phenomenological equation for the thermal dependence of the activation energy of creep

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**Abstract**

A phenomenological equation to model the variation with temperature of the activation energy of creep at high temperature is proposed. This equation expresses the activation energy of the creep as a function of both the metal's high-temperature self-diffusion energy and the relative temperature. The proposed expression considers three fitting parameters, whose roles and typical values are described. The expression is validated with bibliographic data referred to creep experiences carried out on pure polycrystalline specimens of copper, aluminium and silver. Additionally, the proposed expression allows computing the integral mean value of the activation energy for a determined temperatures interval. The obtained results can clearly be of interest to simulate processes under creep or hot deformation conditions.

**Keywords:** creep; metals; creep activation energy; simulation; modelling

## 1. Introduction

It is usually accepted that the creep activation energy, although depending on temperature, is approximately constant when the temperature range is not very wide [1-3]. However, although sometimes ignored, this approach is not consistent when the temperature range is relatively wide. It has been known for years that when the steady-state creep rates of polycrystalline pure metals are determined from creep curves obtained over wide ranges of temperatures around $0.7T_m$ and above (where $T_m$ is the melting temperature of the material), the activation energy of the process, $Q_C$, can be approximated as $Q_{SD}$ (the self-diffusion energy of the material). However, at creep