

Theoretical computation on the critical resolved shear stress of metals at different temperatures in pure shear mode

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Abstract

A temperature-dependent critical resolved shear stress model is developed for metals in pure shear mode based on a limited energy storage viewpoint. The temperature effects on critical resolved shear stress of (Cu-Au)-Co alloys in the range of temperatures between 300 °C and 500 °C which dominated by pure shear mode are predicted. The predicted critical resolved shear stress from the proposed model is highly consistent with experimental data from literatures. When the shear modulus and the specific heat at constant pressure of metals at different temperatures are known, the new temperature-dependent critical resolved shear stress model can precisely predict the critical resolved shear stress of metals at different temperatures from that at an arbitrarily reference temperature without any fitting parameters, avoiding the need to perform high-temperature tests.

Keywords: Temperature-dependent; metals; Critical resolved shear stress; Theoretical computation