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A ameliorative criterion for predicting the glass-forming ability of metallic glasses

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Abstract

A ameliorative criterion for predicting the glass-forming ability of metallic glasses was presented. The coefficient of determination (R^2) of experimental $\log_{10}(R_c)$ versus the predicted $\log_{10}\{R_c^{linear}(T_{rg},D)\}$ is 0.72. When the predicted $\log_{10}\{R_c^{linear}(T_{rg},D)\}$ is replaced with our predicted $\log_{10}\{R_c^{linear}(T_{rg},\frac{1}{D})\}$, the coefficient of determination (R^2) will increase from 0.72 to 0.94, which is a great improvement for evaluating glass-forming ability (GFA).

Keywords: Reduced glass transition temperature; Strength parameter; Glass-forming ability;

1. Introduction

Upon cooling a liquid below the melting point T_m, it enters into a metastable undercooling liquid state [1]. A undercooling liquid will become a glassy state at glass transition temperature, if crystallization process is to be bypassed [2]. Glass-forming ability (GFA) of an alloy is a measure of the ease of vitrification, suggesting whether the alloy is a candidate for bulk metallic glasses (BMGs) using conventional casting processes [3]. Some new metallic glasses with a potential for biomedical and engineering applications have been reported [4-6]. Accordingly, GFA acts as a critical parameter in designing and developing new BMGs with unique mechanical properties.

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