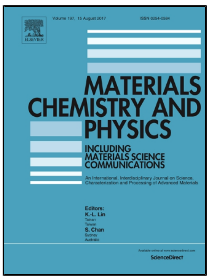
Accepted Manuscript



Analysis of Diffusion in High Entropy Alloys

Tumpa R. Paul, Irina V. Belova, Graeme E. Murch

PII:	S0254-0584(17)30481-9
DOI:	10.1016/j.matchemphys.2017.06.039
Reference:	MAC 19779
To appear in:	*Materials Chemistry and Physics*
Received Date:	28 March 2017
Revised Date:	04 June 2017
Accepted Date:	17 June 2017

Please cite this article as: Tumpa R. Paul, Irina V. Belova, Graeme E. Murch, Analysis of Diffusion in High Entropy Alloys, *Materials Chemistry and Physics* (2017), doi: 10.1016/j.matchemphys.2017.06.039

Analysis of Diffusion in High Entropy Alloys

Tumpa R. Paul[a], Irina V. Belova[a] and Graeme E. Murch[a]

[a]The University Centre for Mass and Thermal Transport in Engineering Materials

Priority Research Centre for Geotechnical and Materials Modelling

School of Engineering

The University of Newcastle

Callaghan, NSW 2308

Australia

Keywords: High-entropy alloys, Diffusion, Interdiffusion

Abstract

High-entropy alloys (HEAs) are a class of multicomponent alloys consisting of five or more principal elements with equal (or nearly equal) compositions. Diffusion plays an important role in these alloys and, indeed, if diffusion is rather sluggish, it may be partly responsible for the apparent stability of HEAs. For the understanding of diffusion properties of HEAs, the full diffusion kinetics behaviour of self-diffusion and interdiffusion in HEAs needs to be investigated. This problem is addressed in this paper by extending and applying three diffusion kinetics formalisms, one due to Darken, a combination of one from Manning and one from Holdsworth and Elliott (HE), and a 'light' version of one due to Moleko, Allnatt and Allnatt. Recently, an elegant and novel quasi-binary variation of a standard experimental interdiffusion set-up was used in a study of diffusion in a CoCrFeMnNi alloy [1, 2]. We successfully address these quasi-binary interdiffusion experiments analytically by applying the above random alloy diffusion kinetics formalisms for the case of $CoCrFeMn_{0.5}Ni$ in order to extract self-diffusion coefficients. This success now suggests that the quasi-binary variation of a standard interdiffusion set-up should be used more widely for diffusion studies in multicomponent alloys, especially HEAs.

1. Introduction

Material development is vitally important for progress in the technological world, much of which is dependent on high performance metals. Up to now, most conventional alloys have