On the Microsegregation of Al-Mg Alloys by Thermal Analysis and Numerical Modeling

M.H. Avazkonandeh-Gharavol, M. Haddad-Sabzevar, H. Fredriksson

PII: S0925-8388(14)01092-5
DOI: http://dx.doi.org/10.1016/j.jallcom.2014.05.026
Reference: JALCOM 31215

To appear in:

Received Date: 24 February 2014
Revised Date: 30 April 2014
Accepted Date: 5 May 2014

Please cite this article as: M.H. Avazkonandeh-Gharavol, M. Haddad-Sabzevar, H. Fredriksson, On the Microsegregation of Al-Mg Alloys by Thermal Analysis and Numerical Modeling, (2014), doi: http://dx.doi.org/10.1016/j.jallcom.2014.05.026

On the Microsegregation of Al-Mg Alloys by Thermal Analysis and Numerical Modeling

M.H. Avazkonandeh-Gharavol[1], M. Haddad-Sabzevar[1*], H. Fredriksson[2]

[1] Department of Metallurgy and Materials Engineering, Faculty of Engineering, Ferdowsi University of Mashhad, Azadi Square, P.O. Box 91775-1111, Mashhad, Iran

[2] Materials Science and Engineering Department, Royal Institute of Technology, Brinellvägen 23, 100 44 Stockholm, Sweden

M.H. Avazkonandeh-Gh., email: mhgharavol@gmail.com

[*] Corresponding author: M. Haddad-Sabzevar email: haddadm@um.ac.ir, phone: +98 511 8763305

H. Fredriksson, email: hassef@kth.se

Abstract

Knowledge about solid fraction versus temperature during solidification is crucial for the control of solidification processes. In the present paper solidification sequence and path of Al-Mg binary alloys containing 6.7 and 10.2 wt.% Mg was investigated by a series of DTA and quenching experiments and numerical modeling in 0.5 and 5 K min^{-1} cooling rates. Experimental results show that at both cooling rates, Al-6.7 wt.% Mg solidifies with a single phase structure, but Al-10.2 wt.% Mg solidifies with a two phase structure. According to the results of numerical modeling, good agreement between calculated solidification curves and experimental solid fractions, but poor correlation with concentration profiles. The source of discrepancies is discussed according to different theories of microsegregation.