

## Accepted Manuscript

Nickel-aluminum diffusion: A study of evolution of microstructure and phase

Hossein Alimadadi, Cecilia Kjartansdóttir, Andrew Burrows, Takeshi Kasama, Per Møller



PII: S1044-5803(17)31057-4  
DOI: doi: [10.1016/j.matchar.2017.05.039](https://doi.org/10.1016/j.matchar.2017.05.039)  
Reference: MTL 8700  
To appear in: *Materials Characterization*  
Received date: 12 April 2017  
Revised date: ###REVISDDATE###  
Accepted date: 31 May 2017

Please cite this article as: Hossein Alimadadi, Cecilia Kjartansdóttir, Andrew Burrows, Takeshi Kasama, Per Møller, Nickel-aluminum diffusion: A study of evolution of microstructure and phase, *Materials Characterization* (2017), doi: [10.1016/j.matchar.2017.05.039](https://doi.org/10.1016/j.matchar.2017.05.039)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

**Nickel-Aluminum diffusion; A study of evolution of microstructure and phase**

Hossein Alimadadi<sup>1,†</sup>, Cecilía Kjartansdóttir<sup>2</sup>, Andrew Burrows<sup>1</sup>, Takeshi Kasama<sup>1</sup> and Per Møller<sup>2</sup>

<sup>1</sup>Technical University of Denmark, Center for Electron Nanoscopy, Fysikvej, building 307, DK–2800 Kongens Lyngby, Denmark.

<sup>2</sup>Technical University of Denmark, Department of Mechanical Engineering, Produktionstorvet, building 425, DK – 2800 Kongens Lyngby, Denmark.

† Corresponding Author, E-Mail: hoal@cen.dtu.dk, Tel.: +45 45256494

**Keywords:** Diffusion; Kirkendall effect; Intermetallics; Aluminum-Nickel binary alloys; Grain boundary diffusion; Electron microscopy

**Abstract:**

Microstructural and phase evolution of an aluminum deposit on nickel, after heat treatment at 883 K, is studied by means of various microscopy techniques, i.e. energy dispersive X-ray spectroscopy, backscattered electron imaging, electron backscatter diffraction, ion channeling contrast imaging and scanning transmission electron microscopy.  $\text{AlNi}_3$  crystallites are observed on the aluminum grain boundaries after only 3 min. of heat treatment indicating that nickel and nickel rich phases are the initially diffusing and forming species. Heat treatment for 120 min. or longer results in the formation of  $\text{Al}_3\text{Ni}_2$  and a porous  $\text{Al}_3\text{Ni}_2/\gamma\text{-Al}_2\text{O}_3$  structure at the surface. The  $\text{Al}_3\text{Ni}_2$  layer is composed of two different grain morphologies, indicating the position of a Kirkendall plane, and hence, there is a high diffusion rate of aluminum in this phase.

Download English Version:

<https://daneshyari.com/en/article/5454696>

Download Persian Version:

<https://daneshyari.com/article/5454696>

[Daneshyari.com](https://daneshyari.com)