Role of Yttrium Substitution in the Atomic Cluster Evolution and Corrosion Behaviour of Al-Ni-Gd Metallic Glasses

Y.G. Wang¹, Y.J. Li¹, S.P. Pan², B.D. Fu¹, J. Y. Qin¹, W.M. Wang^{1,*}

¹ Key Laboratory for Liquid-Solid Structural Evolution and Processing of Materials, Ministry of Education, Shandong University, Jinan 250061, China

² Department of Material Science and Engineering, Taiyuan University of Technology, Taiyuan 030024, China

*E-mail: weiminw@sdu.edu.cn

doi: 10.20964/110429

Received: 30 January 2016 / Accepted: 2 March 2016 / Published: 1 April 2016

Atomic cluster evolution and corrosion behaviour of $\text{Al}_{84}\text{Ni}_{10}\text{Gd}_{6-x}\text{Y}_x$ ($x = 0, 2, 4$ and 6) metallic glasses were investigated using experimental methods and *ab initio* molecular dynamic simulations. The shoulder peak area in x-ray diffraction patterns, enthalpy of second and third crystallization and population of $\langle 0\ 3\ 6\ 0 \rangle$ Ni-centered clusters increase with increasing yttrium content, but the onset temperature and enthalpy of first crystallization decrease simultaneously. Yttrium substitution and annealing treatment can aggravate metastable pitting and induce a thicker alumina film during polarization, which can be explained by the segregation of Ni-centered clusters and ordering of Al-rich clusters.

Keywords: Metallic glass; Al alloy; Corrosion; Pitting.

[FULL TEXT](#)

© 2016 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).