Corrosion resistance based on the microstructural array of an Al-3wt%Cu-1wt%Li alloy

Márcio Nunes Zurlo[1], Givanildo Alves dos Santos[1], Elaine Pavini Cintra[1], Antonio Augusto Couto[2], Wislei Riuper Ramos Osorio[3], Roberto Manuel Torresi[4]

[1]Instituto Federal de Educação, Ciência e Tecnologia de São Paulo, [2]Instituto de Pesquisas Energéticas e Nucleares, [3]Universidade Estadual de Campinas, [4]Instituto de Química - USP

e-mail: marciozurlo@gmail.com

The high specific properties of Al-Li alloys have led to tremendous development effort aimed in particular at aerospace applications. Al-Li castings and cast alloys that combine the good properties of Al-Li alloys with foundry technology have great potential in both the aircraft and automotive sectors [1, 2]. In general, the corrosion behavior strongly depends on the structural morphology and chemical composition [3]. In this work, anAl-3wt%Cu-1wt%Li alloy was solidified under upward unsteady state heat flow conditions. Heat was directionally extracted only through a water-cooled bottom made of steel (SAE 1020). The aim of the present work is to investigate the influence of the microstructure of this alloy upon corrosion resistance. Experimental results include secondary dendrite arm spacings (l_2), corrosion potential (E_{Corr}), corrosion rate (i_{Corr}), polarization resistance (R_1) and capacitances values (Z_{CPE}). The corrosion behavior was analysed by electrochemical impedance spectroscopy technique and Tafel extrapolation method conducted in a 3% NaCl solution at room temperature. Coarser dendritic structures tend to improve the corrosion resistance of an Al-3wt%Cu-1wt%Li alloy.

Acknowledgements:
The authors acknowledge financial support provided by PROEQUIPAMENTOS 2014-CAPES (Higher Education Personnel Improvement Coordination).

References:

[1] Wang C, Min G, Lu Q, Lu Z (2004) Solidification structure and mechanical properties of Al–Li–Cu–Zr cast alloys. Int J Cast Metal Res 17: 264-266.

[2] Santos GA (2015) Tecnologia dos materiais metálicos – propriedades, estruturas e processos de Obtenção, 1. ed. Editora Érica Ltda., São Paulo.

[3] Santos GA, Osório WRR, Garcia A, Neto CM, Goulart PR (2006) Effect of dendritic arm spacing on mechanical properties and corrosion resistance of Al

9wt pct Si and Zn 27wt pct Al alloys. Metall Mater Trans A 37: 2525-2538.