Ind Eng Manage 2015, 4:5
http://dx.doi.org/10.4172/2169-0316.C1.009

OMICS International
conferenceseries.com

2nd International Conference and Exhibition on
Industrial Engineering

November 16-18, 2015 Dubai, UAE

Effect of scandium addition on mechanical properties and corrosion resistance of Al 2.5 Mg alloys in acid and neutral media

Zaki Ahmad and **Umbreen Fatima**
COMSATS Institute of Information and Techonology, Pakistan

Scandium is a novel alloying element because of its weight strengthening effect, recrystallization, inhabitation, and its ability to improve weld strength and eliminating hot weld cracking. Al 2.5 Mg alloys containing zero to 0.9 wt.% scandium were fabricated by induction melting and chill cast to investigate the influence of scandium on the mechanical strength, microstructure and corrosion behavior. The studies were mainly confined to corrosion which still remains an unexplored area. Experimental alloys containing 0.3-0.6 wt.% scandium with 0.15% wt. Zr showed higher strengths of 290 and 268 MPa respectively, higher than the strength of Al 6061 and Al 2024. The strengthening in scandium added alloys is caused by the pinning of grain boundaries by the formation of nano Al3 (Sc_{1-x} Zr_3) precipitates and their uniform distribution. Investigations on the effect of scandium on aluminum magnesium alloys in HCL and NaOH have not been investigated. The Al-Mg alloy containing 0.6 Sc showed the corrosion rate of 10.5 mpy which doubles on decreasing the Sc contained 2.3 Sc (10.22 mpy) due to the formation of Al_2O_3 and Sc_2O_3 duplex film. The alloys containing 0.3 Sc showed lower corrosion rate than the alloys containing 0.6 Sc in 0.1 M NaOH. The corrosion rate decreases with age hardening time due to precipitate size, spacing between the precipitate size, spacing between the precipitate and grain and sub-grains sizes. In general, increased aging time increases resistance to corrosion as shown by alloy containing 0.9% scandium with 0.15 Zr. Similar behavior is shown by other alloys containing scandium. It appears that a certain optimum size of precipitates and their distribution affects the rate of corrosion. Studies on open circuit potential vs. time shows that scandium added alloys shows a shift in the potential to more noble values due to formation of a less defective layer of Sc_2O_3 On top of boehmite γ-AlOOH and bayerite $Al(OH)_3$. This shift has a strong influence on the enhancing corrosion resistance. Studies in salt spray chamber show a higher resistance of these alloys. The maximum resistance shown by alloy containing 0.6 wt% Sc with 0.15 Zr may be due to redistribution of β/ and β/-Mg_2Al_3 phase which generates lattice defects. Precipitates of $Al_3(Sc_1$-$xZr_3)$ appear to redistribute their phase and enhance corrosion resistance. Elevated temperature studies at 125° C and at rotational velocities of 300 rpm and 700 rpm showed enhanced corrosion as shown by a shift of potential in the negative direction.

zakiahamd100@gmail.com

Numerical study of the rotor geometry effect on a mixed flow turbine performance

Omar Zine Khelloufi
University of Science and Technology of Oran-Mohamed-Boudiaf, Algeria

The performance of tow mixed flow turbocharger turbine rotors is numerically investigated, the tow rotors differ mainly in their inlet angle geometry, one has a constant blade angle (rotor A) and the other has a nominal constant incidence (rotor B). This study performed with the ICEM and CFX softwares of ANSYS, presents a numerical performance prediction of tow mixed flow for a wide range of rotational speeds and pressure ratios. The influence of inlet blade angle on the turbine performances is also investigated.

omar_zine_gm@yahoo.fr