

Electrochemical Characterization of Al 1100 Alloy in Different Concentration of Ammonium Chloride Solution at Laboratory Temperature

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Abstract

In this study of Al 1100 alloy is selected, the corrosion test was conducted at room temp using Electrochemical studies. The corrodent medium used for the test was 1 M, 75 M, 0.5 M and 0.25 M Ammonium chloride solution. The specimen was washed with distilled water followed by acetone and allowed to dry thoroughly the corrodent specimen was cleaned with brush for remove adhering corrosion product washed with water and acetone, then dried. The corrosion rates are calculated using CH-Instrument. In each case the corrosion rate in ammonium chloride solution decreases and the corrosion becomes decrease in exposure time for Al alloy due to the aluminium in many induced passivation due to the formation of metal chloride layer.

Introduction

Designers get many advanced benefits in designing the components for automobile and aircrai industry through metal matrix composites. In most composites reinforcement is added to the matrix of the bulk material to increase strength and stiffness of the matrix [1-3]. A reduction in material density coupled with an increase in stiffness yield strength can be translated to reduction of structural weight. Experimental Procedure Although series of Al alloy like 2xx, 3xx, 6xx are available Al 1100 alloy as matrix has been identified since it has potential applications in aircrai and space industries because of lower weight to strength ratio high wear resistance, Al 100 is a wrought alloy was chosen at the matrix material as shown in Table 1. Alloy Zn Mg Cu Cr Fe Ti Si Mn Ni Sn Al Percent 5.339 2.156 1.252 0.208 0.133 0.24 0.018 0.011

0.011 0.028 Remain Table 1: He composition of Al 1100. Specimen preparation He cylindrical mould material was cut into 20 × 20 mm pieces using abrasive cutting wheel. Polished according to the metallographic techniques washed with acetone then with distilled water and dried [4-6]. He samples were weighed up to the fourth decimal place using electronic balance and also the specimen dimensions were noted down using vernier guaze. Corrosion test He corrosion test behavior of aluminium 1100 alloy used for the studied of the immersion test. He static immersion corrosion method was adopted to measure of the corrosion loss. He corrosion test behavior of Al 1100 alloy was studied by the immersion test [7,8]. He static immersion corrosion method was adopted to measure the corrosion loss. 1 M NH₄Cl was used for this purposed. 200 ml of the prepared solution was taken in the beaker .sample were suspended in the corrosive medium for dijerent time of intervals up to 96 hours in the steps of 24 hrs. To minimize the contamination of the aqueous solution and loss due to evaporation, the beakers were covered with parafilm papers during the entire test period. Sier the specified time the samples were cleaned mechanically by using a brush in order to remove heavy corrosion deposited on the surface [8]. He corresponding changes in the weights were noted. At least three samples were tested, and average value was taken. Corrosion rates were computed using the equation, Corrosion rates= $\frac{W}{DAT} \times 534$ mpy Where, W is the loss in grams, D is the density of the specimen in gram/cc, A is area of the specimen (inch²) and T is the exposure time in hours. Electrochemical

measurements Tafel polarization studies: Electrochemical measurements were carried out by most metallic corrosion occurs using an electrochemical work station, CH instruments (USA) [9]. Tafel plot analysis is C hemical Sciences Journ al ISSN: 2150-3494 Chemical Sciences Journal Pruthviraj and Vishwa, Chem Sci J 2017, 8:4 DOI: 10.4172/2150-3494.1000175 Research Article Open Access Chem Sci J, an open access journal ISSN: 2150-3494 Volume 8 • Issue 4 • 1000175 performed by extrapolating the linear portion of the measurements were carried out using conventional three electrode Pyrex glass cells with platinum counter electrode and Ag/AgCl electrode as reference electrode [10]. All the values of potential are therefore referred to the SRE. Finely polished by the Al 1100 specimens of 1 cm² surface area was exposed to corrosion medium of di_jerent concentration of Ammonium chloride solution (0.1 m, 0.75 m, 0.50 m, 0.025 m) at laboratory temperature and allowed to establish a steady state open circuit potential [11]. He potentiodynamic current potential curves are recorded by polarizing the specimen to 250 mv cathodically and +250 mv anodically with respect to Open Circuit Potential (OCP) at scan rate of 5 mv. Electrochemical Impedance Spectroscopy studies (EIS): Electrochemical Impedance Spectroscopy (EIS), method is very use full in characterizing electrodes behavior.

He electrode characterization includes the determination of the polarization [12]. He corrosion behavior of the Al 1100 was also obtained from EIS studies using electrochemical work station instruments (USA). In EIS technique a small amplitude ac signal of 10 mv and frequency spectrum from 100 kHz to 0.01 Hz was impressed at the OCP and impedance data was analyzed using Nyquist plots. He charge transfer resistance was extracted from the diameter of the semicircle in Nyquist plots [13]. In all the above measurements, at least three similar results were considered, and their average values are reported. He scanning electron microscope images were recorded to establish the interaction of acid medium with the metal surface using JEOL JSM-6380LA analytical scanning electron microscope (CPRI).