The anti-Corrosive Effect of Aqueous Extract of *Sidaacuta* (Wire Weed) Onaluminium-Copper-Magnesium Alloy in an Alkaline Medium

Alawode Saheed Olalekan
Department of Cement Engineering Technology, The Federal Polytechnic, Ilaro, Nigeria
saheed.alawode@federalpolyilaro.edu.ng

Introduction

Corrosion occurs when metals and alloy react chemically or electrochemically with an external medium to form a stable compound. This results in the destruction, degradation, and deterioration of the metal or alloy. The process reduces the performance and life span of engineering materials and critical infrastructure. To combat this constant and continuous problem, which is often difficult to eliminate completely requires the use of inhibitors as one of the best and cheapest options. This study was designed to investigate the anti-corrosive characteristics of aqueous extract of the leaves of *Sidaacuta* on Al-Cu-Mg alloy in alkaline medium.

Materials and methods

Powdered *S. acuta* leaves were extracted with distilled-deionised water, similarly, 0.5M NaOH was prepared with distilled-deionised water. An alloy of Al-Cu-Mg with a composition 95.5, 4 and 0.5%, respectively was casted using a pit furnace and a mold. The casted alloy was filed, wiped with emery cloth to give a homogeneous smooth surface and cut into grain size known as coupon. The weight, diameter, height and area of each coupon was measured and labeled accordingly. The extract was introduced into the NaOH solution to give a constant volume of 250 mL. The coupons were suspended in the extract-alkaline medium for different hours, days and temperature. The corrosion rate (mpy) and percentage protection of the alloy were determined based on weight loss techniques when the coupons were retrieved after each duration.

Results and discussion

The weight loss for the different coupons after five hours insertion into the 25 and 75 mL of the extract and 0.5 M NaOH extract-alkaline medium were 0.16, 0.58 and 1.55 g; the weight loss for the coupons in the alkaline medium only were 0.58, 1.36, and 2.02 g at 50, 70 and 90^{o}C, respectively. The percentage protection for the alloy at these temperatures were 44, 34 and 23, respectively for the extract-alkaline medium. The corrosion rates in mil/year (mpy) for these losses were 4.3 x 10^{-3}, 1.1.x 10^{-2} and 6.2 x 10^{-3}, respectively for the extract-alkaline medium and 1.14 x 10^{-2}, 2.9 x 10^{-2}, and 9.2 x 10^{-2}, respectively for the alkaline medium only. The weight loss after 10 days of experimentation at room temperature and 1:1 of plant extract and alkaline medium were 1.25 and 1.35g, respectively. The corresponding corrosion rate for these losses were 3.18x10^{-4} and 3.67x10^{-4}mpy respectively. From the results, *S. acuta* inhibited the corrosion of Al-Cu-Mg alloy in an alkaline medium reducing the weight loss compared to the alkaline medium only. This was optimum at 50^{o}C for the corrosion rates and the percentage protection. *Sidaacuta* compared favourably with other green plant inhibitors like green tea, *tulsi* extract and *moringa* leaves that were previously studied in alkaline medium. The current study suggested that *S. acuta* can be used to mitigate the effects of corrosion in Al-Cu-Mg alloy and arrest the attendant economic losses.

Keywords: *Sidaacuta,* Al-Cu-Mg alloy, corrosion inhibition, percentage protection, corrosion rate.