



Acid extract of *Mentha pulegium* as a potential inhibitor for corrosion of 2024 aluminum alloy in 1 M HCl solution

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Received 23 Dec 2012, Revised 21 Mar 2013, Accepted 21 Mar 2013

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Abstract

Inhibitive effect of *Mentha pulegium* extract on the acid corrosion of aluminum in 1 M HCl solution was studied using gravimetric, gasometric and EIS techniques. It was shown that the presence of acid extract of *Mentha pulegium* extract inhibited the corrosion of aluminum in the test solutions and the inhibition efficiency depended on the concentration of the plant extract as well as on the time of exposure of the aluminum samples in HCl solutions containing the extract. Effect of temperature on the corrosion behavior of aluminum in 1M HCl was also studied in the range 298 K and 318 K. The thermodynamic data of activation are determined. *Mentha pulegium* extract is adsorbed on the aluminum surface according to a Temkin adsorption model.

Keywords: Green corrosion inhibitor. Aluminum alloys. *Mentha pulegium* extract.

1. Introduction

Aluminum and its alloys have proved to be strategically important materials and have extensive use in many industries. They are used in the automotive, aviation and aerospace industries, in the making of household appliances, in ship building and military hardware [1-3]. Their usefulness is derived from their very good physical and mechanical properties such as their high strength-to-weight ratio, recyclability, good machining properties, as well as their outstanding resistance to corrosion.

Corrosion control of aluminum and its alloys can be enhanced by the addition of some inorganic substances to the corrodent. The substances include phosphates, chromates, dichromates, silicates, bromates, arsenates, tungstates, molybdates, chlorides and their likes [4-7]. These inorganic inhibitors exhibit toxic effects, expensive and are therefore not environmentally friendly [8]. Consequently, there has been a search for corrosion inhibitors which are not harmful to the environment.

Plant extracts and their derivatives in much greater numbers. It is needless to point out the importance of cheap, safe inhibitors of corrosion. Plant extracts have become important as an environmentally acceptable, readily available, having a heteroatoms (O, S, N) in functional groups and renewable source for wide range of inhibitors. They are the rich sources of ingredients which have very high inhibition efficiency. Plant extracts are viewed as an incredibly rich source of naturally synthesized chemical compounds that can be extracted by simple procedures with low cost. The extracts from the leaves, seeds, heartwood, bark, roots and fruits of plants have been reported to inhibit metallic corrosion in acidic media [9-18]. Medicinal plants were previously used as corrosion inhibitors of aluminum alloys in various environments [19-35].

In Algeria, collection of medicinal and aromatic plants to extract, after distillation, essential oils for the manufacture of cosmetics, pharmaceuticals as well as flavors for food products, is a virgin field.

Many Researches are studies the influence of compounds structure, concentration on inhibition efficiency. Hammouti et al. [36] reported that the essential oil of *Mentha pulegium* appears to be a good inhibitor of steel in 1M HCl and it has very interesting and encouraging inhibition efficiency (85 %).