

CORROSION INHIBITION EFFICACY OF SOME ARID ZONE PLANTS EXTRACTS AS POTENTIAL GREEN INHIBITOR

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ABSTRACT

Corrosion is the deterioration or gradual destruction of metal due to its environment. The application of natural occurring green corrosion inhibitors, which reduces the corrosion rate to a reasonable level and has less impact on the environment is one of the important methods for controlling corrosion in daily life. There is an intensive effort underway to develop new eco-friendly corrosion inhibitors for metal. These efforts have been motivated by the desire to replace toxic inhibitors widely used for mitigation of corrosion. Plants are the rich sources of secondary metabolite like alkaloids, terpanoids, sterol which have very high inhibition efficiency. Several researchers are trying to make use of natural products as potential corrosion inhibitors for metal and alloy in different corrosive environment. This article briefly discusses corrosion inhibition efficiency of some arid zone plants as potential green inhibitors.

Keywords: Corrosion, inhibitors, arid zone plant, Plant extract, inhibition efficiency.

1. INTRODUCTION

Corrosion is a gradual deterioration or destructive process that causes the transformation of pure metals into undesirable substances when they react with corrosive environment. Corrosion is a phenomenon of metals and alloys trying to return to a more stable thermodynamic form due to interaction with the surrounding environment. Corrosion is expensive due to the loss of materials or their properties, which leads to loss of time during maintenance, the shutting down of systems, and severe failure of some structures, which in some cases may be hazardous and cause injury. Methods for protecting metals or alloys from corrosion, e.g. isolating them from the aggressive environment (using a process or chemical film) or compensating for the loss of electrons in the corroding structure (corrosion is an oxidation process) (e.g. by the use of Satisfied current or by active sacrificial anode protection)

Corrosion Inhibitors

Corrosion protection or inhibition are important for minimizing the financial losses and retain occupational safety and equipment life. To minimize the corrosion formation, the first step is to select the appropriate material based on the final design and application. Second, surrounding environment conditions, pH, temperature and the concentration of inhibitor added if required. Protect the metal from the corrosive environment through shielding and compensating for electrons lost through cathodic shielding is another way for corrosion control. The use of corrosion inhibitors is best known method of controlling, preventing or limiting corrosion. Conventional inorganic and organic corrosion inhibitors are two classes of corrosion inhibitors. A good organic inhibitor will have in its structure a polar functional group containing heteroatoms such as O, S or N atoms and π electrons and hydrophobic moieties that fight aggressive aqueous species from the surface of the product[1]. They adsorb on metal surface and formed a protective layer on metal surface.

2. THEORY OF GREEN CORROSION INHIBITOR

The corrosion process is directly related to the Gibbs free energy. The higher the Gibbs free energy, the higher the corrosion rate. Green corrosion inhibitors adsorb on metal surface and during the adsorption process, the free energy have reduced.

Mechanisms of adsorption of Cls molecule on metal surface are as

1. Donor-acceptor exchanges occurring between the π - electrons of ci molecules and the vacant d-orbital of metal substrate
2. Interaction of lone pair electron of the heteroatoms with the vacant d-orbital of metal substrate

Plant product as green corrosion inhibitor

Green corrosion inhibitor has been attracting more and more attention in recent years. Plant extracts are a source of natural products which are used as environmentally friendly corrosion inhibitors. Plants (e.g. extracts and oils) are important green corrosion inhibitors that are widely used in different acidic environments as they have a variety of physical, chemical and biological properties. In recent years, chemicals from natural products have become more popular as anticorrosion agents. In addition, there is an increasing trend of using expired chemicals as corrosion inhibitors because this can reduce disposal costs and environmental pollution.

An Overview- Some Medicinal Arid Zone Plants as Corrosion Inhibitors

S.No.	Botanical name	Common name	Corrosive media	Metal	Extract of plant parts	%IE	Ref.
1	Emblica officinalis	Amla	HCl Sol.	Mild steel	Leaves	88.60	2
2	Saraca indica	Ashok	Water	Mild steel	Leaves	91.00	3
3	Prosopis juliflora	jungle kikar	H ₂ SO ₄ Sol	Mild steel	Leaves	94.00	4
4	Aegle marmelos	Bael / Bilva	H ₂ SO ₄ Sol.	Zn	Fruit,Root	81.20	5
5	Aloe Verra	Gritkumari	Sea water	Mild Steel	Leaves	98.00	6
6	Azadirachta indica	Neem	H ₂ SO ₄ Sol	Mild Steel	Seed, Leaves, Fruit	81.80	7
7	Cassia auriculatain	Amaltas	HCl Sol.	Mildsteel, Al	Flower	86.00	8
8	Tecomella undulata	Rohida	HCl Sol.	Copper	Seed	93.84	9
9	Prosopis cineraria	Khejri	NaOH	Al	Pods	83.86	10
10	Acacia nilotica	Babul	H ₂ SO ₄ Sol.	Mild Steel	Leaves	87.57	11
11	Acacia senegal	Kumatiyo	HCl Sol.	Mild Steel	Leaves	90.32	12
12	Cordia dichotoma	Lasora	HCl Sol.	Al alloy	seeds	90.63	13
13	Capparis decidua	Kair	NaOH	Al	Whole plant	95.20	14
14	Euphorbia caducifolia	Danda thor	H ₂ SO ₄ Sol	Mild Steel	Flower	99.05	15
15	Calotropis procera	Aak	HNO ₃	Copper	Whole plant	93.9	16
16	Argemone mexicana	Satyanashi	H ₂ SO ₄ Sol	Mild Steel	Leaves	91.4	17
17	Solanum surattence	Choti Kateri	HCl Sol.	Al	Whole plant	98.27	18
18	Leptadenia pyrotechnica	Kheep	HCl Sol.	Mild Steel	Stem	93.07	19
19	Ziziphus mauritiana	Ber	H ₂ SO ₄ , HCl	Mild Steel	Leaves	77.33, 84.86	20
20	Prosopis juliflora	Jungle kikar	HCl	Mild Steel	Whole plant	93.15	21

3. CONCLUSIONS

Arid zone plants are worked as excellent green corrosion inhibitors under a variety of corrosive environments for most of the metals. The non-toxicity and biodegradability are the major advantages for these inhibitors. Although a number of publications are witnessing the green inhibitors are retard the corrosion rate and widely used as a potential corrosion combating agent against corrosion at different environments.

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