1 INTRODUCTION

Natural resources and infrastructure of any country are responsible for economic development. Corrosion is responsible for damaging bridges, airports buildings offices, irrigation systems, land and air transport, school buildings and industrial installations. Due to corrosion, the natural, industrial environments, efficiency and durability of the industrial equipment and infrastructure assets are affected. Human being and ecosystem are much affected by corrosion and pollution. The natural phenomenon of corrosion may be reduced by corrosion control methods.

The easy fabrication and cost-effectiveness of mild steel combined with excellent mechanical property is the main reason for using it in construction material, automobile Industries, petrochemical, chemical and metallurgical industries. Hydrochloric acid is used in many industries such as acidification, pickling bath, petrochemical processes. Mild steel suffers severe damage and it results in corrosion of the metal. Alkali solutions are used in alkaline cleaning, pickling and itching process.

Aluminium is the second largest attractive anode material after iron and it possesses excellent mechanical properties. It is an attractive anode material and it has high specific conductivity, high energy density, and high negative electrode potential compared to iron. It has many industrial applications namely construction purposes, automobile industries, aerospace industries, electrical power generation, ship hull and submerged pipelines.

Aluminium is utilized as an anode material for power sources due to its excellent properties **(Emregul *et al*, 2008)**. For better utilization of as an anode material in air battery, the corrosion of Al and its alloy can be studied in aqueous alkaline solutions. **Zhang *et al*, 2002** explained corrosion meets huge difficulties namely passivation of cathode materials, enhances the electrical resistance of solid products which enhances the discharge rate, and migrate to the counter anode. Though Al/air battery is an eco-friendly system, it is not often used due to the evolution of H_2. It is necessary to reduce H_2 evolution for Al industrial usage.

1.1 Impact of corrosion

Many dangerous effects are occurred by corrosion. They are efficiency loss, product contamination, and metallic parts repair, unfit to use metallic materials, valuable materials lost, unexpected accidents and reduction of the natural resource.

1.2 The Effects of Corrosion in Society

Corrosion impacts economic and environmental deterioration as well as the infrastructure. Apart from the loss of material, the corrosion interfering with the safety of human control of the industrial operation and damages the environment. Understanding corrosion and the protection of the control of the weather and the appropriate environment for compliance with the law of corrosion.

1.3 Classification of Inhibitors

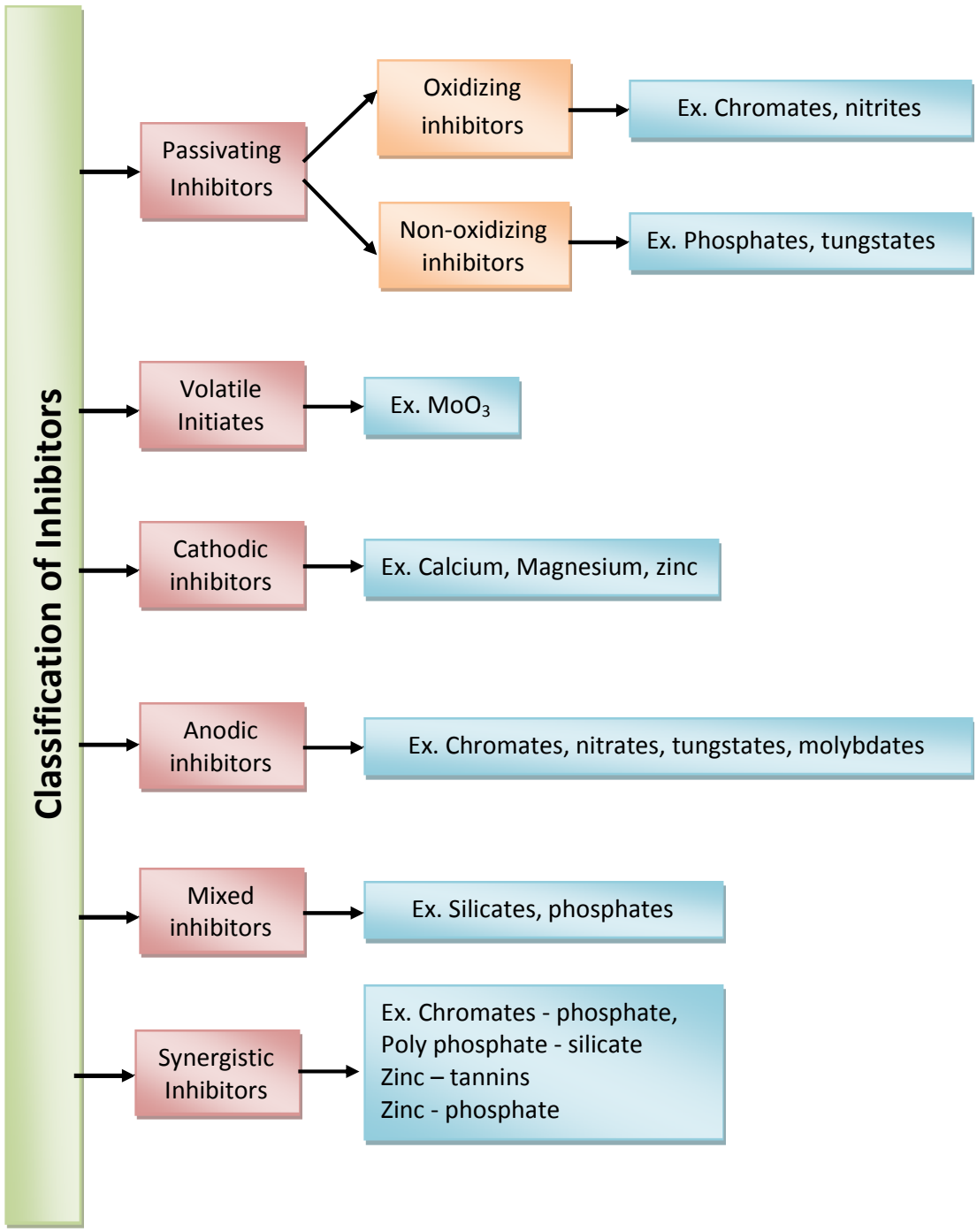

Figure 1.1 Classifications of Inhibitors

1.4 Cost of corrosion

The global cost of corrosion is estimated to be US$ 2.5 trillion, 3.4% of the global Gross Domestic Product (GDP) (2013) exclusive of individual safety and environmental consequences. With the commonly available corrosion control practices, 15 and 35% may be restored on the cost of corrosion.

1.5 Natural products are utilized for corrosion inhibition studies-An experimental approach

Human health and safety considerations made the scientists concentrate on the use of natural compounds present in the plant parts which contained many organic compounds namely amino acids, alkaloids, pigments and tannins are used to replace the toxic and hazardous compounds. The inhibition mechanism mainly depends on the chemical properties of acids, parameters like concentration and temperature of the corrosive medium, dissolved organic and inorganic substance present in the acidic solution, mechanical behaviour of metals, structure and functional groups present in the investigated inhibitors.

This encouraged us to analyse the effectiveness of *Passiflora vitifolia, Pyrostegia venusta* (leaves) and *Sargassum polycystum*, *Padina boergesenii* (seaweed) for mitigating the MS and AA corrosion in hydrochloric and sodium hydroxide medium. The investigated plants/seaweeds were authenticated by Botanical Survey of India (BSI).

1. 5.1 PLANT DESCRIPTION : I

Passiflora vitifolia kunthi-One of the large and showy flowers of the forest, the crimson passion flower is one of the most beautiful places in bloom. This woody vine is distinguished by its large leaves (up to 15 cm long), lobed in the shape of grapes with two glands at the base and cylindrical stems. The flowers, of intense crimson colour, are formed individually along with the plant in sequence. The flowers have bright red petals with red, yellow or white crown strands in 3 series and green sepals. The fruits are equally distinguishable, up to 8 cm long, green with white spots. The fruits contain numerous seeds. The fruit of the *Passiflora vitifolia* is acid but edible; it can take up to a month to mature after falling from the vine **(Patel *et al*, 2011).**

Kingdom : *Plantae - Plants*

Order : Malpighiales

Family : Passifloraceae-Passion-flower

Genus : Passiflora L. - passion flower

Species : *Passiflora vitifolia* Kunth – Perfumed passion flower

Botanical and common name :*Passiflora vitifolia,* Perfumed Passion Flower

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1.5.2 PLANT DESCRIPTION : II

Pyrostegia venusta (Ker-Gawl) Miers is a Bignoniaceae family type plant. It has evergreen vine flower and is found in subtropical areas and tropical areas in the cold season. The plant parts are used for cough and influenza **(Ferreira *et al*, 2000, Roy *et al*, 2011).** It belongs to plantae kingdom and the order is Lamiales. The genus and species are Pyrostegia and venusta. Tamil name of this flower is Thanga pu.

Scientific and common name: *Pyrostegia venusta* (KerGawl.)Miers, Orange trumpet vine, orange creeper

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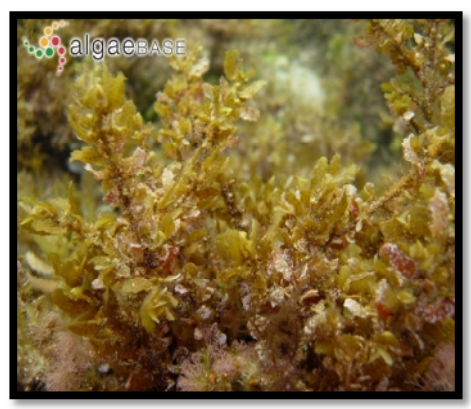
1.5.3 PLANT DESCRIPTION: III

Sargassum polycystum C. Agardhis a dark brown to yellowish brown colour seaweed and is belonging to sargassaceae family. It has a short and cylindrical shape of the stem. It is found in Philippines, China, Japan, Indonesia, and Malaysia with tropical warm waters condition **(Buwono *et al*, 2018, Srinivasa Rao, 2002).** Sargassum species are tropical brown and subtropical macroalgae (marine algae) from shallow seagrass beds. Red and brown seaweed contained plenty of bioactive secondary



metabolites. Its empire, kingdom, phylum, class, sub class, order and genus are Eukaryota, Chromista, Ochrophyta, Phaeophyceae, Fucophycidae, Fucales and Sargassum.

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1.5.4 PLANT DESCRIPTION: IV

Padina boergesenii Alender & Kraft is a brown algae dispersed in the north of Persian Gulf and Oman Sea. The brown seaweed Padina and widely distributed along the Indian coast and Padina species are important sources of mannitol and iodine. The brown seaweed *Padina boergesenii* (*P. boergesenii*) is a vegetative body with a form of ventilation, segmented, ruined and of a light brown colour. The presence of phenolic compounds and their antitumor activity by *P. boergesenii* is demonstrated in vivo. *Padina boergesenii* is one of the most common species available in the coast of Muttom, Tamilnadu **(Karthikeyan *et al*, 2010)**. It belongs to dictyotaceae family and its genus, empire, kingdom, class, sub class are Padina, eukaryote, chromista, phaeophyceae, ductyotophycidae.

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1.6 OBJECTIVES

- To find out the phytochemical constituents present in leaves extracts of *Passiflora vitifolia* (PAVL), *Pyrostegia venusta* (PVL) and marine algae-seaweed extracts of *Sargassum polycystum* (SP), *Padina boergesnii* (PB) using preliminary phytochemical screening analysis and characterised by HPTLC,GC-MS, UV and FT-IR.
- To examine the efficacy of acid/alkaline extracts of PAVL, PVL, SP and PB as eco-friendly corrosion inhibitors for MS/AA by electrochemical measurements and conventional mass loss method.
- To fit the suitable adsorption isotherm for all the investigated inhibitors using MS / AA in 1M HCl/1M NaOH.

- To assess the topography of MS/AA surface with and without using investigated inhibitors in 1M HCl/1M NaOH medium.
- To carry out quantum chemical calculation for the selected phytochemicals present in the investigated inhibitors.

Review of literature for the current investigation is presented in Chapter 2.