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Anticorrosive assay-guided isolation of active phytoconstituents from *Anthemis pseudocotula* extracts and a detailed study of their effects on the corrosion of mild steel in acidic media†

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In this study, anticorrosive properties of various extracts (methanolic, aqueous methanolic and water extracts) of *Anthemis pseudocotula* for mild steel in 1.0 M HCl media is screened for the first time. Among the various tested extracts, the methanolic extract of *A. pseudocotula* shows the highest corrosion inhibition activity. Anticorrosive assay-guided isolation of this methanolic extract results in the isolation of a highly potent anticorrosive compound, **APB** (luteolin-7-*O*-β-D-glucoside). The anticorrosive effects of **APB** on mild steel in 1.0 M HCl media were evaluated in detail using gravimetric, Tafel plots, linear polarization, electrochemical impedance spectroscopy and SEM and EDS techniques. Tafel plots reveal that **APB** acts as a mixed-type inhibitor. The adsorption behaviour of this green inhibitor on the mild-steel surface obeys the Langmuir adsorption isotherm. A surface morphology study through SEM and EDS analysis displays a noteworthy upgraded surface morphology of the mild steel plate in the presence of the green inhibitor in 1.0 M HCl media. The results obtained from electrochemical tests and weight loss measurements are in good agreement which shows excellent inhibition efficiency for the natural compound **APB**.

Introduction

Corrosion is a common problem for several metals. In industries, it creates several major problems because of its perilous nature for metals.[1] The damage done by corrosion engenders more costs for the examination, renovation and replacement of various equipment and constitutes serious public and environmental risks. Corrosion of metals cannot be completely stopped, but it can be drastically reduced using various approaches, such as upgrading the materials, blending production fluids, process control and using chemical corrosion inhibitors.[2] Among these methods, the use of chemical corrosion inhibitors is usually the most suitable, practical and economical approach to accomplish this goal.[3] Several synthetic molecules have been reported as valuable corrosion inhibitors for metals.[4,5] However, most of them are expensive and extremely toxic to human being and the environment. The toxicity of synthetic compounds and uncompromising environmental directives have led to the use of natural products as safe and effective green corrosion inhibitors.[6–8]

Natural products have the advantage of being biodegradable in nature, renewable, easily accessible, economical and, most importantly, are environmental friendly. Recently, several natural products, particularly plant extracts, have been reported to be an excellent, environmentally benign and economical source of corrosion inhibitors.[9–11] The extracts of various plants and their parts (leaves, fruits, roots, *etc.*) have been reported to possess commendable corrosion inhibition properties for metals in various corrosive media.[12–15] For example, the reported plant extracts with promising corrosion inhibitive properties include *Zanthoxylum alatum*,[9] *Phyllanthus amarus*,[13] *Uncaria gambir*,[10] *Strychnos nux-vomica*,[16] *Murraya koenigii*,[7] *Schinopsis lorentzii*,[17] *Phragmites australis*,[14] *Brugmansia suaveolens*, *Cassia roxburghii*,[11] *Polycarpaea corymbosa* and *Desmodium triflorum*.[15]

Although several plant extracts have been described to be prominent corrosion inhibitors for metals in different corrosive media, it has been well established that the inhibitive actions of plant extracts originate from the mixture of organic molecules in their composition. The organic molecules that are responsible for corrosion inhibitive actions have not been isolated and identified in most scientific investigations on green corrosion inhibitors.[6,7,10,11,14,17] Therefore, as part of our ongoing investigations on Saudi Arabian plants for the advancement of products of potential economic values,[18,19] we report here for the first time the corrosion inhibitive action of *Anthemis pseudocotula*

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