*Berberine* Isolated from *Mahonia Nepalensis* as an Eco-Friendly and Thermally Stable Corrosion Inhibitor for Mild Steel in Acid Medium

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Supplementary table: S1

Some important absorption bands/ peaks from FTIR measurements of Berberine.

|  |  |
| --- | --- |
| Absorption Peaks | Functional groups |
| 3657.04 cm-1 | O-H stretching of alcohol |
| 3336.14 cm-1 | N-H stretching of amine |
| 3201.8 cm-1 | O-H stretching of H-bonded alcohols phenols |
| 2962.66 cm-1 | C-H alkanes |
| 1604.77 cm-1 | Aromatic C=C or N-H bending |
| 1508.33 cm-1 | N-O stretching |
| 1454.32 cm-1 | Phenyl C-C |
| 1384.88 cm-1 | O-H bending alcohol, phenol |
| 1334.74 cm-1 | C-N stretching aromatic amine |
| 1222.86 cm-1 | C-O stretching vinyl, aryl or alkyl ether |
| 1049.27 cm-1 | C-O stretching primary alcohol, CO-O-CO stretching of anhydride, C-N stretching of aliphatic amine |

Supplementary table: S2

Corrosion rate and inhibition efficiency of MS in 1000 ppm Berberine at various times.

|  |  |  |  |
| --- | --- | --- | --- |
| Time | Corrosion Rate (mg/cm2h) | | Inhibition Efficiency (%) |
| For Acid without inhibitor | For acid with inhibitor |
| 15 min | 61.27 | 5.35 | 91.28 |
| 45 min | 62.31 | 4.88 | 92.17 |
| 90 min | 63.60 | 4.39 | 93.10 |
| 3 hrs | 70.84 | 4.56 | 93.57 |
| 6 hrs | 80.37 | 4.84 | 93.98 |
| 9 hrs | 81.09 | 4.08 | 94.97 |
| 12 hrs | 81.93 | 3.70 | 95.49 |
| 24 hrs | 82.05 | 3.27 | 96.01 |

Supplementary table: S3

Corrosion rate and inhibition efficiency of berberine on MS specimen corrosion with concentrations.

|  |  |  |  |
| --- | --- | --- | --- |
| Concentration (ppm) | Corrosion Rate  (mg/cm2h) | Inhibition efficiency (%) | Surface Coverage (θ) |
| Blank (0) | 82.52 |  |  |
| 200 | 7.42 | 91.01 | 0.9101 |
| 400 | 5.74 | 93.05 | 0.9305 |
| 600 | 5.05 | 93.89 | 0.9389 |
| 800 | 4.47 | 94.58 | 0.9458 |
| 1000 | 4.22 | 94.89 | 0.9489 |

Supplementary table: S4

Results of EDX elemental analysis of MS after immersion of 24 hrs in 1.0 M H2SO4 and 1.0 M H2SO4 + 400 and 1000 ppm of Berberine

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Condition | Iron | Carbon | Nitrogen | Oxygen |
| Acid without inhibitor | 97.5% | 1.7% |  | 0.8% |
| Acid with inhibitor of 400 ppm | 96.9% | 1.7% | 0.4% | 0.9% |
| Acid with inhibitor of 1000 ppm | 95.4% | 3.20% | 0.5% | 0.9% |

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