Data Article

HR-SEM and FT-IR dataset for green corrosion inhibition activity of 4-{{4-(pyridin-2-yl)piperazin-1-yl}methyl}aniline at CO₂ atmosphere

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A B S T R A C T

Mild steel (MS) corrosion inhibiting aptitude of 4-{{4-(pyridin-2-yl)piperazin-1-yl}methyl}aniline (PPMA), is presented \cite{1-3} in this data set. Explorations of synthesized PPMA are carried out by FT-IR spectral analysis, nuclear magnetic resonance (NMR) and high resolution scanning electron microscopy (HR-SEM). The inhibition activity is investigated by potentiodynamic method. The FT-IR and NMR results revealed that structure. These data sets are ideal tool for the applications like physical and chemical-engineering field.

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Specifications Table

| Subject                | Chemical Science                |
|------------------------|---------------------------------|
| Specific subject area  | Physical chemistry and Chemical engineering |
| Type of data           | Table, Figure and Schemes.      |
| How data was acquired  | Spectroscopic and microscopic data used to the (corrosion resistive) engineering applications is explored. |
| Data format            | Raw data.                       |
| Parameters for data collection | NMR and FT-IR spectra were recorded, FT-IR spectra were recorded with thermo scientific spectrometer, model no. iS5 equipped with attenuated total reflectance (ATR) competence which is implemented by Zn-Se crystal detector. Each spectrum was recorded with an achievement time of 18 s. The FT-IR dimension was scanned at a range from 4000 to 400 cm\(^{-1}\). |
| Description of data collection | FT-IR and NMR spectral consequence reveals that structure and purity of the catalyst such as PPMA [4]. HR-SEM morphology of as-synthesized PPMA and MS interacted PPMA is predicted. |
| Data source location   | Department of Chemistry, Laxminarayana College of Arts & Science, Dharmapuri, Tamilnadu, India, and SAIF-IIT Madras. |
| Data accessibility     | The data is available with this article |

Value of the Data

- The data were represent a valuable collection of the intact individual spectroscopic and microscopic data of PPMA interacted MS.
- The microscopic images and plots provide a novel way to look at the effectiveness of the corrosion inhibition potential of PPMA and further evolutions for other researchers to expand the future outcomes [2–5].
- The FT-IR data provides specifying binding frequencies of the PPMA with MS [6].
- This data allows other researchers to explore or extend the corrosion inhibition activity analysis of petroleum oil storage containers at different atmosphere.

1. Data Description

We present data includes the more information on (See Tables 1 and S1) the HR-SEM data of PPMA interaction with MS and Fig. 1 show the morphology of the reported materials. The Fig. 2 and Schemes S1 and 1 shows the synthetic scheme and corrosion inhibition efficiency data in (See Table 2). The resulted data are provided in Supplementary Table S1.

![Scheme 1. Synthesis of PPMA.](image-url)
Table 1
MS corrosion inhibition data of PPMA at CO₂ atmosphere.

| Applied Potential (V) | Time (s)  | WE (1).Current (A) | Index | WE (1).Potential (V) |
|-----------------------|-----------|--------------------|-------|----------------------|
| −1.39755              | 6.64484   | −0.00745           | 1     | −1.39679             |
| −1.39511              | 6.88884   | −0.00744           | 2     | −1.39465             |
| −1.39267              | 7.13284   | −0.00744           | 3     | −1.39252             |
| −1.39023              | 7.37684   | −0.00743           | 4     | −1.39069             |
| −1.38779              | 7.62084   | −0.00743           | 5     | −1.38763             |
| −1.38535              | 7.86484   | −0.00743           | 6     | −1.3858              |
| −1.3829               | 8.10884   | −0.00742           | 7     | −1.38275             |
| −1.38046              | 8.35284   | −0.00742           | 8     | −1.38062             |
| −1.37802              | 8.59684   | −0.00741           | 9     | −1.37787             |
| −1.37558              | 8.84084   | −0.00741           | 10    | −1.37573             |
| −1.37314              | 9.08484   | −0.0074            | 11    | −1.37268             |
| −1.3707               | 9.32884   | −0.0074            | 12    | −1.37085             |
| −1.36826              | 9.57284   | −0.00739           | 13    | −1.36749             |
| −1.36581              | 9.81684   | −0.00739           | 14    | −1.36597             |
| −1.36337              | 10.0608   | −0.00739           | 15    | −1.36353             |
| −1.36093              | 10.3048   | −0.00738           | 16    | −1.36047             |
| −1.35849              | 10.5488   | −0.00738           | 17    | −1.35834             |
| −1.35605              | 10.7928   | −0.00737           | 18    | −1.35559             |
| −1.35361              | 11.0368   | −0.00737           | 19    | −1.35315             |
| −1.35117              | 11.2808   | −0.00736           | 20    | −1.35071             |
| −1.34872              | 11.5248   | −0.00736           | 21    | −1.34857             |
| −1.34628              | 11.7688   | −0.00735           | 22    | −1.34644             |
| −1.34384              | 12.0128   | −0.00735           | 23    | −1.34338             |
| −1.3414               | 12.2568   | −0.00735           | 24    | −1.34125             |
| −1.33896              | 12.5008   | −0.00734           | 25    | −1.3385              |
| −1.33652              | 12.7448   | −0.00734           | 26    | −1.33636             |
| −1.33408              | 12.9888   | −0.00733           | 27    | −1.33392             |
| −1.33163              | 13.2328   | −0.00733           | 28    | −1.33148             |
| −1.32919              | 13.4768   | −0.00732           | 29    | −1.32965             |
| −1.32675              | 13.7208   | −0.00732           | 30    | −1.3269              |
| −1.32431              | 13.9648   | −0.00731           | 31    | −1.32385             |
| −1.32187              | 14.2088   | −0.00731           | 32    | −1.32141             |
| −1.31943              | 14.4528   | −0.0073            | 33    | −1.31927             |
| −1.31699              | 14.6968   | −0.0073            | 34    | −1.31714             |
| −1.31454              | 14.9408   | −0.00729           | 35    | −1.31439             |
| −1.3121               | 15.1848   | −0.00729           | 36    | −1.31226             |
| −1.30966              | 15.4288   | −0.00729           | 37    | −1.30951             |
| −1.30722              | 15.6728   | −0.00728           | 38    | −1.30707             |
| −1.30478              | 15.9168   | −0.00728           | 39    | −1.30463             |
| −1.30234              | 16.1608   | −0.00727           | 40    | −1.30188             |
| −1.2999               | 16.4048   | −0.00727           | 41    | −1.29944             |
| −1.29745              | 16.6488   | −0.00726           | 42    | −1.2973              |
| −1.29501              | 16.8928   | −0.00726           | 43    | −1.29517             |
| −1.29257              | 17.1368   | −0.00725           | 44    | −1.29211             |
| −1.29013              | 17.3808   | −0.00725           | 45    | −1.28937             |
| −1.28769              | 17.6248   | −0.00725           | 46    | −1.28723             |
| −1.28525              | 17.8688   | −0.00724           | 47    | −1.28479             |
| −1.28281              | 18.1128   | −0.00724           | 48    | −1.28235             |
| −1.28036              | 18.3568   | −0.00723           | 49    | −1.28021             |
| −1.27792              | 18.6008   | −0.00723           | 50    | −1.27747             |
| −1.27548              | 18.8448   | −0.00722           | 51    | −1.27472             |
| −1.27304              | 19.0888   | −0.00721           | 52    | −1.27289             |
| −1.26916              | 19.3328   | −0.00721           | 53    | −1.27014             |
| −1.26572              | 19.5768   | −0.00721           | 54    | −1.2677              |
| −1.26328              | 19.8208   | −0.0072            | 55    | −1.26526             |
| −1.26083              | 20.0648   | −0.0072            | 56    | −1.26343             |
| −1.25839              | 20.3088   | −0.00719           | 57    | −1.26038             |
| −1.25595              | 20.5528   | −0.00719           | 58    | −1.25793             |
| −1.25351              | 20.7968   | −0.00718           | 59    | −1.25549             |
| −1.25107              | 21.0408   | −0.00718           | 60    | −1.25366             |

(continued on next page)
| Applied Potential (V) | Time (s) | WE (1).Current (A) | Index | WE (1).Potential (V) |
|----------------------|---------|--------------------|-------|---------------------|
| −1.2507              | 21.2848 | −0.00717           | 61    | −1.25               |
| −1.24863             | 21.5288 | −0.00717           | 62    | −1.24817            |
| −1.24619             | 21.7728 | −0.00716           | 63    | −1.24542            |
| −1.24374             | 22.0168 | −0.00716           | 64    | −1.24329            |
| −1.2413              | 22.2608 | −0.00716           | 65    | −1.24115            |
| −1.23886             | 22.5048 | −0.00715           | 66    | −1.23871            |
| −1.23642             | 22.7488 | −0.00715           | 67    | −1.23566            |
| −1.23398             | 22.9928 | −0.00714           | 68    | −1.23352            |
| −1.23154             | 23.2368 | −0.00714           | 69    | −1.23108            |
| −1.2291              | 23.4808 | −0.00713           | 70    | −1.22864            |
| −1.22665             | 23.7248 | −0.00713           | 71    | −1.22681            |
| −1.22421             | 23.9688 | −0.00712           | 72    | −1.22375            |
| −1.22177             | 24.2128 | −0.00712           | 73    | −1.22131            |
| −1.21933             | 24.4568 | −0.00712           | 74    | −1.21887            |
| −1.21689             | 24.7008 | −0.00711           | 75    | −1.21674            |
| −1.21445             | 24.9448 | −0.00711           | 76    | −1.21368            |
| −1.21201             | 25.1888 | −0.0071            | 77    | −1.21155            |
| −1.20956             | 25.4328 | −0.0071            | 78    | −1.2088             |
| −1.20712             | 25.6768 | −0.00709           | 79    | −1.20667            |
| −1.20468             | 25.9208 | −0.00709           | 80    | −1.20422            |
| −1.20224             | 26.1648 | −0.00708           | 81    | −1.20209            |
| −1.1998              | 26.4088 | −0.00708           | 82    | −1.19904            |
| −1.19736             | 26.6528 | −0.00708           | 83    | −1.1972             |
| −1.19492             | 26.8968 | −0.00707           | 84    | −1.19476            |
| −1.19247             | 27.1408 | −0.00707           | 85    | −1.19202            |
| −1.19003             | 27.3848 | −0.00706           | 86    | −1.18927            |
| −1.18759             | 27.6288 | −0.00706           | 87    | −1.18713            |
| −1.18515             | 27.8728 | −0.00706           | 88    | −1.185               |
| −1.18271             | 28.1168 | −0.00705           | 89    | −1.18195            |
| −1.18027             | 28.3608 | −0.00705           | 90    | −1.17981            |
| −1.17783             | 28.6048 | −0.00706           | 91    | −1.17737            |
| −1.17538             | 28.8488 | −0.00706           | 92    | −1.17493            |
| −1.17294             | 29.0928 | −0.00705           | 93    | −1.17218            |
| −1.1705              | 29.3368 | −0.00705           | 94    | −1.17035            |
| −1.16806             | 29.5808 | −0.00704           | 95    | −1.16791            |
| −1.16562             | 29.8248 | −0.00704           | 96    | −1.16547            |
| −1.16318             | 30.0688 | −0.00703           | 97    | −1.16272            |
| −1.16074             | 30.3128 | −0.00703           | 98    | −1.16089            |
| −1.15829             | 30.5568 | −0.00702           | 99    | −1.15845            |
| −1.15585             | 30.8008 | −0.00702           | 100   | −1.1554             |
| −1.15341             | 31.0448 | −0.00701           | 101   | −1.15356            |
| −1.15097             | 31.2888 | −0.00701           | 102   | −1.15112            |
| −1.14853             | 31.5328 | −0.00701           | 103   | −1.14868            |
| −1.14609             | 31.7768 | −0.007              | 104   | −1.14502            |
| −1.14365             | 32.0208 | −0.007              | 105   | −1.14349            |
| −1.1412              | 32.2648 | −0.00699            | 106   | −1.14075            |
| −1.13876             | 32.5088 | −0.00699            | 107   | −1.13861            |
| −1.13632             | 32.7528 | −0.00698            | 108   | −1.13647            |
| −1.13388             | 32.9968 | −0.00698            | 109   | −1.13373            |
| −1.13144             | 33.2408 | −0.00697            | 110   | −1.13098            |
| −1.129               | 33.4848 | −0.00697            | 111   | −1.12885            |
| −1.12656             | 33.7288 | −0.00696            | 112   | −1.1261             |
| −1.12411             | 33.9728 | −0.00696            | 113   | −1.12396            |
| −1.12167             | 34.2168 | −0.00695            | 114   | −1.12122            |
| −1.11923             | 34.4608 | −0.00695            | 115   | −1.11877            |
| −1.11679             | 34.7048 | −0.00694            | 116   | −1.11664            |
| −1.11435             | 34.9488 | −0.00694            | 117   | −1.11389            |
| −1.11191             | 35.1928 | −0.00693            | 118   | −1.11237            |
| −1.10947             | 35.4368 | −0.00693            | 119   | −1.10801            |
| −1.10703             | 35.6808 | −0.00692            | 120   | −1.10657            |
| −1.10458             | 35.9248 | −0.00692            | 121   | −1.10382            |

(continued on next page)
| Applied Potential (V) | Time (s) | WE (1).Current (A) | Index | WE (1).Potential (V) |
|----------------------|---------|--------------------|-------|----------------------|
| −1.0214             | 36.1688 | −0.00691           | 122   | −1.01999             |
| −1.0997             | 36.4128 | −0.00691           | 123   | −1.09894             |
| −1.09726            | 36.6568 | −0.0069           | 124   | −1.09711             |
| −1.09482            | 36.9008 | −0.0069           | 125   | −1.09436             |
| −1.09238            | 37.1448 | −0.00689          | 126   | −1.09192             |
| −1.08994            | 37.3888 | −0.00689          | 127   | −1.08978             |
| −1.08749            | 37.6328 | −0.00688          | 128   | −1.08734             |
| −1.08505            | 37.8768 | −0.00688          | 129   | −1.08521             |
| −1.08261            | 38.1208 | −0.00687          | 130   | −1.08215             |
| −1.08017            | 38.3648 | −0.00687          | 131   | −1.08032             |
| −1.07773            | 38.6088 | −0.00686          | 132   | −1.07697             |
| −1.07529            | 38.8528 | −0.00686          | 133   | −1.07483             |
| −1.07285            | 39.0968 | −0.00685          | 134   | −1.07208             |
| −1.0704             | 39.3408 | −0.00684          | 135   | −1.06995             |
| −1.06796            | 39.5848 | −0.00684          | 136   | −1.0675              |
| −1.06552            | 39.8288 | −0.00683          | 137   | −1.06567             |
| −1.06308            | 40.0728 | −0.00683          | 138   | −1.06262             |
| −1.0582             | 40.5608 | −0.00682          | 140   | −1.05804             |
| −1.05576            | 40.8408 | −0.00681          | 141   | −1.05591             |
| −1.05331            | 41.0488 | −0.00681          | 142   | −1.05316             |
| −1.05087            | 41.2928 | −0.0068           | 143   | −1.05042             |
| −1.04843            | 41.5368 | −0.00679          | 144   | −1.04828             |
| −1.04599            | 41.7808 | −0.00679          | 145   | −1.04523             |
| −1.04355            | 42.0248 | −0.00678          | 146   | −1.0434              |
| −1.04111            | 42.2688 | −0.00678          | 147   | −1.04126             |
| −1.03867            | 42.5128 | −0.00677          | 148   | −1.03851             |
| −1.03622            | 42.7568 | −0.00677          | 149   | −1.03638             |
| −1.03378            | 43.0008 | −0.00676          | 150   | −1.03363             |
| −1.03134            | 43.2448 | −0.00676          | 151   | −1.03058             |
| −1.0289             | 43.4888 | −0.00675          | 152   | −1.02814             |
| −1.02646            | 43.7328 | −0.00675          | 153   | −1.02631             |
| −1.02402            | 43.9768 | −0.00674          | 154   | −1.02386             |
| −1.02158            | 44.2208 | −0.00673          | 155   | −1.02081             |
| −1.01913            | 44.4648 | −0.00673          | 156   | −1.01929             |
| −1.01669            | 44.7088 | −0.00672          | 157   | −1.01654             |
| −1.01425            | 44.9528 | −0.00672          | 158   | −1.01379             |
| −1.01181            | 45.1968 | −0.00671          | 159   | −1.01166             |
| −1.00937            | 45.4408 | −0.0067           | 160   | −1.00922             |
| −1.00693            | 45.6848 | −0.0067           | 161   | −1.00647             |
| −1.00449            | 45.9288 | −0.00669          | 162   | −1.00433             |
| −1.00204            | 46.1728 | −0.00668          | 163   | −1.00159             |
| −0.9996             | 46.4168 | −0.00667          | 164   | −0.99976             |
| −0.99716            | 46.6608 | −0.00667          | 165   | −0.99731             |
| −0.99472            | 46.9048 | −0.00666          | 166   | −0.99426             |
| −0.99228            | 47.1488 | −0.00666          | 167   | −0.99213             |
| −0.98984            | 47.3928 | −0.00665          | 168   | −0.9903              |
| −0.9874             | 47.6368 | −0.00665          | 169   | −0.98755             |
| −0.98496            | 47.8808 | −0.00664          | 170   | −0.9845              |
| −0.98251            | 48.1248 | −0.00664          | 171   | −0.98267             |
| −0.98007            | 48.3688 | −0.00664          | 172   | −0.98023             |
| −0.97763            | 48.6128 | −0.00664          | 173   | −0.97748             |
| −0.97519            | 48.8568 | −0.00663          | 174   | −0.97504             |
| −0.97275            | 49.1008 | −0.00663          | 175   | −0.97229             |
| −0.97031            | 49.3448 | −0.00662          | 176   | −0.96985             |
| −0.96787            | 49.5888 | −0.00661          | 177   | −0.96771             |
| −0.96542            | 49.8328 | −0.00661          | 178   | −0.96527             |
| −0.96298            | 50.0768 | −0.0066          | 179   | −0.96314             |
| −0.96054            | 50.3208 | −0.00659          | 180   | −0.96039             |
| −0.9581             | 50.5648 | −0.00659          | 181   | −0.95825             |
| −0.95566            | 50.8088 | −0.00658          | 182   | −0.95551             |
| Applied Potential (V) | Time (s)  | WE (1).Current (A) | Index | WE (1).Potential (V) |
|----------------------|-----------|-------------------|-------|---------------------|
| −0.95322             | 51.0528   | −0.00657          | 183   | −0.95245            |
| −0.95078             | 51.2968   | −0.00657          | 184   | −0.95062            |
| −0.94833             | 51.5408   | −0.00656          | 185   | −0.94849            |
| −0.94589             | 51.7848   | −0.00655          | 186   | −0.94574            |
| −0.94345             | 52.0288   | −0.00655          | 187   | −0.9433             |
| −0.94101             | 52.2728   | −0.00654          | 188   | −0.94116            |
| −0.93857             | 52.5168   | −0.00654          | 189   | −0.93872            |
| −0.93613             | 52.7608   | −0.00653          | 190   | −0.93597            |
| −0.93369             | 53.0048   | −0.00652          | 191   | −0.93292            |
| −0.93124             | 53.2488   | −0.00652          | 192   | −0.93109            |
| −0.9288              | 53.4928   | −0.00651          | 193   | −0.92835            |
| −0.92636             | 53.7368   | −0.0065           | 194   | −0.9259             |
| −0.92392             | 53.9808   | −0.0065           | 195   | −0.92407            |
| −0.92148             | 54.2248   | −0.00649          | 196   | −0.92133            |
| −0.91904             | 54.4688   | −0.00648          | 197   | −0.91888            |
| −0.9166              | 54.7128   | −0.00647          | 198   | −0.91644            |
| −0.91415             | 54.9568   | −0.00647          | 199   | −0.9137             |
| −0.91171             | 55.2008   | −0.00646          | 200   | −0.91156            |
| −0.90927             | 55.4448   | −0.00645          | 201   | −0.90881            |
| −0.90683             | 55.6888   | −0.00645          | 202   | −0.90637            |
| −0.90439             | 55.9328   | −0.00644          | 203   | −0.90393            |
| −0.90195             | 56.1768   | −0.00643          | 204   | −0.9021             |
| −0.89951             | 56.4208   | −0.00642          | 205   | −0.89966            |
| −0.89706             | 56.6648   | −0.00642          | 206   | −0.89661            |
| −0.89462             | 56.9088   | −0.00641          | 207   | −0.89447            |
| −0.89218             | 57.1528   | −0.0064           | 208   | −0.89172            |
| −0.88974             | 57.3968   | −0.00639          | 209   | −0.88928            |
| −0.8873              | 57.6408   | −0.00639          | 210   | −0.88715            |
| −0.88486             | 57.8848   | −0.00638          | 211   | −0.88471            |
| −0.88242             | 58.1288   | −0.00637          | 212   | −0.88287            |
| −0.87997             | 58.3728   | −0.00636          | 213   | −0.88013            |
| −0.87753             | 58.6168   | −0.00635          | 214   | −0.87708            |
| −0.87509             | 58.8608   | −0.00635          | 215   | −0.87463            |
| −0.87265             | 59.1048   | −0.00634          | 216   | −0.87219            |
| −0.87021             | 59.3488   | −0.00633          | 217   | −0.87006            |
| −0.86777             | 59.5928   | −0.00632          | 218   | −0.86731            |
| −0.86533             | 59.8368   | −0.00631          | 219   | −0.86517            |
| −0.86289             | 60.0808   | −0.00631          | 220   | −0.86243            |
| −0.86044             | 60.3248   | −0.0063           | 221   | −0.85999            |
| −0.858               | 60.5688   | −0.00629          | 222   | −0.85754            |
| −0.85556             | 60.8128   | −0.00628          | 223   | −0.85541            |
| −0.85312             | 61.0568   | −0.00627          | 224   | −0.85266            |
| −0.85068             | 61.3008   | −0.00626          | 225   | −0.85022            |
| −0.84824             | 61.5448   | −0.00626          | 226   | −0.84808            |
| −0.8458              | 61.7888   | −0.00625          | 227   | −0.84625            |
| −0.84335             | 62.0328   | −0.00624          | 228   | −0.84351            |
| −0.84091             | 62.2768   | −0.00623          | 229   | −0.84106            |
| −0.83847             | 62.5208   | −0.00622          | 230   | −0.83832            |
| −0.83603             | 62.7648   | −0.00622          | 231   | −0.83557            |
| −0.83359             | 63.0088   | −0.00621          | 232   | −0.83344            |
| −0.83115             | 63.2528   | −0.0062           | 233   | −0.83099            |
| −0.82871             | 63.4968   | −0.00619          | 234   | −0.82886            |
| −0.82626             | 63.7408   | −0.00618          | 235   | −0.82642            |
| −0.82382             | 63.9848   | −0.00617          | 236   | −0.82336            |
| −0.82138             | 64.2288   | −0.00617          | 237   | −0.82123            |
| −0.81894             | 64.4728   | −0.00616          | 238   | −0.81848            |
| −0.8165              | 64.7168   | −0.00615          | 239   | −0.81665            |
| −0.81406             | 64.9608   | −0.00614          | 240   | −0.81451            |
| −0.81162             | 65.2048   | −0.00613          | 241   | −0.81146            |
| −0.80917             | 65.4488   | −0.00612          | 242   | −0.80872            |
| −0.80673             | 65.6928   | −0.00611          | 243   | −0.80627            |

(continued on next page)
| Applied Potential (V) | Time (s)  | WE (1).Current (A) | Index  | WE (1).Potential (V) |
|-----------------------|-----------|--------------------|--------|---------------------|
| −0.80429             | 65.9368   | −0.0061            | 244    | −0.80444            |
| −0.80185             | 66.1808   | −0.00609           | 245    | −0.8017             |
| −0.79941             | 66.4248   | −0.00608           | 246    | −0.79895            |
| −0.79697             | 66.6688   | −0.00607           | 247    | −0.79681            |
| −0.79453             | 66.9128   | −0.00606           | 248    | −0.79407            |
| −0.79208             | 67.1568   | −0.00605           | 249    | −0.79193            |
| −0.78964             | 67.4008   | −0.00604           | 250    | −0.7898             |
| −0.7872              | 67.6448   | −0.00603           | 251    | −0.78644            |
| −0.78476             | 67.8888   | −0.00602           | 252    | −0.78491            |
| −0.78232             | 68.1328   | −0.00601           | 253    | −0.78217            |
| −0.77988             | 68.3768   | −0.00599           | 254    | −0.78003            |
| −0.77744             | 68.6208   | −0.00598           | 255    | −0.77759            |
| −0.77499             | 68.8648   | −0.00597           | 256    | −0.77515            |
| −0.77255             | 69.1088   | −0.00596           | 257    | −0.7724             |
| −0.77011             | 69.3528   | −0.00595           | 258    | −0.77026            |
| −0.76767             | 69.5968   | −0.00594           | 259    | −0.76782            |
| −0.76523             | 69.8408   | −0.00593           | 260    | −0.76538            |
| −0.76279             | 70.0848   | −0.00592           | 261    | −0.76263            |
| −0.76035             | 70.3288   | −0.00591           | 262    | −0.7608             |
| −0.7579              | 70.5728   | −0.00589           | 263    | −0.75775            |
| −0.75546             | 70.8168   | −0.00588           | 264    | −0.75562            |
| −0.75302             | 71.0608   | −0.00587           | 265    | −0.75162            |
| −0.75058             | 71.3048   | −0.00586           | 266    | −0.74927            |
| −0.74814             | 71.5488   | −0.00585           | 267    | −0.74683            |
| −0.7457              | 71.7928   | −0.00583           | 268    | −0.74439            |
| −0.74326             | 72.0368   | −0.00582           | 269    | −0.74182            |
| −0.74081             | 72.2808   | −0.00581           | 270    | −0.7395             |
| −0.73837             | 72.5248   | −0.0058            | 271    | −0.737              |
| −0.73593             | 72.7688   | −0.00578           | 272    | −0.73471            |
| −0.73349             | 73.0128   | −0.00577           | 273    | −0.73224            |
| −0.73105             | 73.2568   | −0.00576           | 274    | −0.72971            |
| −0.72861             | 73.5008   | −0.00575           | 275    | −0.72726            |
| −0.72617             | 73.7448   | −0.00573           | 276    | −0.72476            |
| −0.72372             | 73.9888   | −0.00572           | 277    | −0.72238            |
| −0.72128             | 74.2328   | −0.00571           | 278    | −0.71988            |
| −0.71884             | 74.4768   | −0.00569           | 279    | −0.71759            |
| −0.7164              | 74.7208   | −0.00568           | 280    | −0.71518            |
| −0.71396             | 74.9648   | −0.00566           | 281    | −0.71274            |
| −0.71152             | 75.2088   | −0.00565           | 282    | −0.71024            |
| −0.70908             | 75.4528   | −0.00564           | 283    | −0.70776            |
| −0.70664             | 75.6968   | −0.00562           | 284    | −0.70532            |
| −0.70419             | 75.9408   | −0.00561           | 285    | −0.703              |
| −0.70175             | 76.1848   | −0.00559           | 286    | −0.70044            |
| −0.69931             | 76.4288   | −0.00558           | 287    | −0.69827            |
| −0.69687             | 76.6728   | −0.00556           | 288    | −0.69574            |
| −0.69443             | 76.9168   | −0.00554           | 289    | −0.69336            |
| −0.69199             | 77.1608   | −0.00553           | 290    | −0.69058            |
| −0.68955             | 77.4048   | −0.00551           | 291    | −0.68823            |
| −0.6871              | 77.6488   | −0.0055            | 292    | −0.68573            |
| −0.68466             | 77.8928   | −0.00548           | 293    | −0.68353            |
| −0.68222             | 78.1368   | −0.00546           | 294    | −0.68088            |
| −0.67978             | 78.3808   | −0.00544           | 295    | −0.67868            |
| −0.67734             | 78.6248   | −0.00542           | 296    | −0.67621            |
| −0.6749              | 78.8688   | −0.00541           | 297    | −0.67386            |
| −0.67246             | 79.1128   | −0.00539           | 298    | −0.67142            |
| −0.67001             | 79.3568   | −0.00537           | 299    | −0.66885            |
| −0.66757             | 79.6008   | −0.00535           | 300    | −0.66638            |
| −0.66513             | 79.8448   | −0.00533           | 301    | −0.66391            |
| −0.66269             | 80.0888   | −0.00531           | 302    | −0.66162            |
| −0.66025             | 80.3328   | −0.00529           | 303    | −0.65912            |
| −0.65781             | 80.5768   | −0.00527           | 304    | −0.65698            |
Table 1 (continued)

| Applied Potential (V) | Time (s)      | WE (1).Current (A) | Index | WE (1).Potential (V) |
|-----------------------|---------------|--------------------|-------|-----------------------|
| -0.65537              | -0.65292      | -0.65048           | -0.64804 | -0.6456              | -0.64316 | -0.64072 | -0.63828 | -0.63583 | -0.63339 | -0.63095 | -0.62851 | -0.62607 | -0.62363 | -0.62119 | -0.61874 | -0.6163 | -0.61386 | -0.61142 | -0.60898 | -0.60654 | -0.6041 | -0.60165 | -0.59921 | -0.59677 | -0.59433 | -0.59189 | -0.58945 | -0.58701 | -0.58456 | -0.58212 | -0.57968 | -0.57724 | -0.5748 | -0.57236 | -0.56992 | -0.56747 | -0.56503 | -0.56259 | -0.56015 | -0.55771 | -0.55527 | -0.55283 | -0.55039 | -0.54794 | -0.5455 | -0.54306 | -0.54062 | -0.53818 | -0.53574 | -0.5333 | -0.53085 | -0.52841 | -0.52597 | -0.52353 | -0.52109 | -0.51865 | -0.51621 | -0.51376 | -0.51132 |
| 80.8208               | 81.0648       | 81.3088            | 81.5528 | 81.7968              | 82.0408 | 82.2848 | 82.5288 | 82.7728 | 83.0168 | 83.2608 | 83.5048 | 83.7488 | 83.9928 | 84.2368 | 84.4808 | 84.7248 | 84.9688 | 85.2128 | 85.4568 | 85.7008 | 85.9448 | 86.1888 | 86.4328 | 86.6768 | 86.9208 | 87.1648 | 87.4088 | 87.6528 | 87.8968 | 88.1408 | 88.3848 | 88.6288 | 88.8728 | 89.1168 | 89.3608 | 89.6048 | 89.8488 | 90.0928 | 90.3368 | 90.5808 | 90.8248 | 91.0688 | 91.3128 | 91.5688 | 91.8008 | 92.0448 | 92.2888 | 92.5328 | 92.7768 | 93.0208 | 93.2648 | 93.5088 | 93.7528 | 93.9968 | 94.2408 | 94.4848 | 94.7288 | 94.9728 | 95.2168 | -0.00525 | -0.00523 | -0.00521 | -0.00518 | -0.00516 | -0.00514 | -0.00511 | -0.00509 | -0.00506 | -0.00504 | -0.00502 | -0.00499 | -0.00496 | -0.00493 | -0.0049 | -0.00486 | -0.00483 | -0.00479 | -0.00475 | -0.00471 | -0.00466 | -0.00462 | -0.00457 | -0.00452 | -0.00447 | -0.00441 | -0.00435 | -0.00428 | -0.00421 | -0.00414 | -0.00406 | -0.00398 | -0.00389 | -0.00381 | -0.00372 | -0.00362 | -0.00353 | -0.00344 | -0.00335 | -0.00326 | -0.00317 | -0.00308 | -0.00299 | -0.0029 | -0.00282 | -0.00274 | -0.00266 | -0.00258 | -0.0025 | -0.00243 | -0.00235 | -0.00228 | -0.00221 | -0.00214 | -0.00208 | -0.00201 | -0.00195 | -0.00189 | -0.00183 | -0.00177 | -0.65427 | -0.65189 | -0.64926 | -0.647 | -0.64444 | -0.64221 | -0.63959 | -0.63739 | -0.63467 | -0.63254 | -0.62988 | -0.62759 | -0.62485 | -0.62271 | -0.62018 | -0.61795 | -0.61527 | -0.61295 | -0.61026 | -0.60809 | -0.60547 | -0.60336 | -0.60083 | -0.59851 | -0.59601 | -0.59341 | -0.59094 | -0.58838 | -0.58618 | -0.58368 | -0.58148 | -0.57895 | -0.57651 | -0.57382 | -0.5715 | -0.56912 | -0.5669 | -0.56424 | -0.56201 | -0.55948 | -0.55716 | -0.55457 | -0.55234 | -0.54965 | -0.54733 | -0.54495 | -0.5426 | -0.54019 | -0.53781 | -0.53519 | -0.53272 | -0.53037 | -0.52792 | -0.5256 | -0.52313 | -0.52081 | -0.51828 | -0.51596 | -0.51328 | -0.5109 | (continued on next page)
| Applied Potential (V) | Time (s)  | WE (1).Current (A) | Index  | WE (1).Potential (V) |
|----------------------|-----------|--------------------|--------|----------------------|
| −0.50888             | 95.4608   | −0.00172           | 365    | −0.50842             |
| −0.50644             | 95.7048   | −0.00166           | 366    | −0.50623             |
| −0.504               | 95.9488   | −0.00161           | 367    | −0.50375             |
| −0.50156             | 96.1928   | −0.00156           | 368    | −0.5014              |
| −0.49912             | 96.4368   | −0.00151           | 369    | −0.49878             |
| −0.49667             | 96.6808   | −0.00146           | 370    | −0.49646             |
| −0.49423             | 96.9248   | −0.00142           | 371    | −0.49384             |
| −0.49179             | 97.1688   | −0.00137           | 372    | −0.49155             |
| −0.48935             | 97.4128   | −0.00134           | 373    | −0.48892             |
| −0.48691             | 97.6568   | −0.00129           | 374    | −0.48654             |
| −0.48447             | 97.9008   | −0.00124           | 375    | −0.48425             |
| −0.48203             | 98.1448   | −0.00112           | 376    | −0.48184             |
| −0.47958             | 98.3888   | −0.00117           | 377    | −0.47949             |
| −0.47714             | 98.6328   | −0.00113           | 378    | −0.4769              |
| −0.4747              | 98.8768   | −0.00109           | 379    | −0.47437             |
| −0.47226             | 99.1208   | −0.00106           | 380    | −0.47192             |
| −0.46982             | 99.3648   | −0.00103           | 381    | −0.46957             |
| −0.46738             | 99.6088   | −0.001             | 382    | −0.46716             |
| −0.46494             | 99.8528   | −0.00096           | 383    | −0.46494             |
| −0.46249             | 100.097   | −0.00094           | 384    | −0.46237             |
| −0.46005             | 100.341   | −0.0009            | 385    | −0.45993             |
| −0.45761             | 100.585   | −0.00088           | 386    | −0.4574              |
| −0.45517             | 100.829   | −0.00085           | 387    | −0.4549              |
| −0.45273             | 101.073   | −0.00082           | 388    | −0.45236             |
| −0.45029             | 101.317   | −0.0008            | 389    | −0.4502              |
| −0.44785             | 101.561   | −0.00077           | 390    | −0.4476              |
| −0.4454              | 101.805   | −0.00075           | 391    | −0.44534             |
| −0.44296             | 102.049   | −0.00073           | 392    | −0.44266             |
| −0.44052             | 102.293   | −0.00071           | 393    | −0.44049             |
| −0.43808             | 102.537   | −0.00069           | 394    | −0.43784             |
| −0.43564             | 102.781   | −0.00067           | 395    | −0.43552             |
| −0.4332              | 103.025   | −0.00065           | 396    | −0.43289             |
| −0.43076             | 103.269   | −0.00063           | 397    | −0.4307              |
| −0.42831             | 103.513   | −0.00061           | 398    | −0.4281              |
| −0.42587             | 103.757   | −0.00059           | 399    | −0.42584             |
| −0.42343             | 104.001   | −0.00057           | 400    | −0.42337             |
| −0.42099             | 104.245   | −0.00055           | 401    | −0.42108             |
| −0.41855             | 104.489   | −0.00053           | 402    | −0.41852             |
| −0.41611             | 104.733   | −0.00051           | 403    | −0.41586             |
| −0.41367             | 104.977   | −0.00049           | 404    | −0.41339             |
| −0.41122             | 105.221   | −0.00048           | 405    | −0.4108              |
| −0.40878             | 105.465   | −0.00046           | 406    | −0.40866             |
| −0.40634             | 105.709   | −0.00044           | 407    | −0.40616             |
| −0.4039              | 105.953   | −0.00042           | 408    | −0.40387             |
| −0.40146             | 106.197   | −0.0004             | 409    | −0.40125             |
| −0.39902             | 106.441   | −0.00039           | 410    | −0.39899             |
| −0.39658             | 106.685   | −0.00037           | 411    | −0.39633             |
| −0.39414             | 106.929   | −0.00035           | 412    | −0.39398             |
| −0.39169             | 107.173   | −0.00033           | 413    | −0.39139             |
| −0.38925             | 107.417   | −0.00031           | 414    | −0.38913             |
| −0.38681             | 107.661   | −0.00029           | 415    | −0.38672             |
| −0.38437             | 107.905   | −0.00027           | 416    | −0.38434             |
| −0.38193             | 108.149   | −0.00025           | 417    | −0.3819              |
| −0.37949             | 108.393   | −0.00023           | 418    | −0.3793              |
| −0.37705             | 108.637   | −0.0002             | 419    | −0.37692             |
| −0.3746              | 108.881   | −0.00018           | 420    | −0.37436             |
| −0.37216             | 109.125   | −0.00016           | 421    | −0.37198             |
| −0.36972             | 109.369   | −0.00013           | 422    | −0.36945             |
| −0.36728             | 109.613   | −0.0001             | 423    | −0.36728             |
| −0.36484             | 109.857   | −0.718E-05          | 424    | −0.36462             |
| −0.3624              | 110.101   | −4.08E-05           | 425    | −0.36234             |

(continued on next page)
Table 1 (continued)

| Applied Potential (V) | Time (s) | WE (1).Current (A) | Index | WE (1).Potential (V) |
|-----------------------|---------|--------------------|-------|----------------------|
| −0.35996              | 110.345 | −8.42E-06          | 426   | −0.35974             |
| −0.35751              | 110.589 | 2.73E-05           | 427   | −0.35751             |
| −0.35507              | 110.833 | 6.57E-05           | 428   | −0.35495             |
| −0.35263              | 111.077 | 0.000107           | 429   | −0.35269             |
| −0.35019              | 111.321 | 0.000152           | 430   | −0.35022             |
| −0.34775              | 111.565 | 0.000193           | 431   | −0.34781             |
| −0.34531              | 111.809 | 0.000234           | 432   | −0.34561             |
| −0.34287              | 112.053 | 0.000287           | 433   | −0.34314             |
| −0.34042              | 112.297 | 0.000346           | 434   | −0.34088             |
| −0.33798              | 112.541 | 0.000412           | 435   | −0.33795             |
| −0.33554              | 112.785 | 0.000488           | 436   | −0.33557             |
| −0.3331               | 113.029 | 0.00057            | 437   | −0.33292             |
| −0.33066              | 113.273 | 0.000658           | 438   | −0.33066             |
| −0.32822              | 113.517 | 0.000752           | 439   | −0.32813             |
| −0.32578              | 113.761 | 0.000851           | 440   | −0.3259              |
| −0.32333              | 114.005 | 0.000956           | 441   | −0.3233              |
| −0.32089              | 114.249 | 0.001065           | 442   | −0.32111             |
| −0.31845              | 114.493 | 0.00118            | 443   | −0.31851             |
| −0.31601              | 114.737 | 0.0013             | 444   | −0.31632             |
| −0.31357              | 114.981 | 0.001426           | 445   | −0.31363             |
| −0.31113              | 115.225 | 0.001559           | 446   | −0.3111              |
| −0.30869              | 115.469 | 0.001694           | 447   | −0.30862             |
| −0.30624              | 115.713 | 0.001833           | 448   | −0.30624             |
| −0.3038               | 115.957 | 0.001977           | 449   | −0.30396             |
| −0.30136              | 116.201 | 0.002124           | 450   | −0.30167             |
| −0.29892              | 116.445 | 0.002275           | 451   | −0.29916             |
| −0.29648              | 116.689 | 0.002431           | 452   | −0.29654             |
| −0.29404              | 116.933 | 0.00259            | 453   | −0.29419             |
| −0.2916               | 117.177 | 0.002752           | 454   | −0.29178             |
| −0.28915              | 117.421 | 0.002918           | 455   | −0.2894              |
| −0.28671              | 117.665 | 0.003087           | 456   | −0.28708             |
| −0.28427              | 117.909 | 0.003257           | 457   | −0.28473             |
| −0.28183              | 118.153 | 0.003426           | 458   | −0.28226             |
| −0.27939              | 118.397 | 0.003593           | 459   | −0.27966             |
| −0.27695              | 118.641 | 0.003755           | 460   | −0.27728             |
| −0.27451              | 118.885 | 0.003909           | 461   | −0.27484             |
| −0.27206              | 119.129 | 0.004051           | 462   | −0.2724              |
| −0.26962              | 119.373 | 0.00418            | 463   | −0.27017             |
| −0.26718              | 119.617 | 0.004295           | 464   | −0.26761             |
| −0.26474              | 119.861 | 0.004396           | 465   | −0.26547             |
| −0.2623               | 120.105 | 0.004487           | 466   | −0.26285             |
| −0.25986              | 120.349 | 0.004568           | 467   | −0.26059             |
| −0.25742              | 120.593 | 0.004641           | 468   | −0.25781             |
| −0.25497              | 120.837 | 0.004708           | 469   | −0.25562             |
| −0.25253              | 121.081 | 0.004769           | 470   | −0.25308             |
| −0.25009              | 121.325 | 0.004825           | 471   | −0.25085             |
| −0.24765              | 121.569 | 0.004878           | 472   | −0.24814             |
| −0.24521              | 121.813 | 0.004926           | 473   | −0.24597             |
| −0.24277              | 122.057 | 0.004972           | 474   | −0.24365             |
| −0.24033              | 122.301 | 0.005014           | 475   | −0.24118             |
| −0.23789              | 122.545 | 0.005055           | 476   | −0.23868             |
| −0.23544              | 122.789 | 0.005092           | 477   | −0.23615             |
| −0.233                | 123.033 | 0.005128           | 478   | −0.23364             |
| −0.23056              | 123.277 | 0.005163           | 479   | −0.23129             |
| −0.22812              | 123.521 | 0.005195           | 480   | −0.22888             |
| −0.22568              | 123.765 | 0.005226           | 481   | −0.22638             |
| −0.22324              | 124.009 | 0.005256           | 482   | −0.22424             |
| −0.2208               | 124.253 | 0.005284           | 483   | −0.22162             |
| −0.21835              | 124.497 | 0.005311           | 484   | −0.21927             |
| −0.21591              | 124.741 | 0.005338           | 485   | −0.21652             |
| Applied Potential (V) | Time (s) | WE (1).Current (A) | Index | WE (1).Potential (V) |
|-----------------------|---------|--------------------|-------|---------------------|
| −0.21347             | 124.985 | 0.005362           | 486   | −0.21423
| −0.21103             | 125.229 | 0.005386           | 487   | −0.21164
| −0.20859             | 125.473 | 0.005409           | 488   | −0.20953
| −0.20615             | 125.717 | 0.005432           | 489   | −0.20691
| −0.20371             | 125.961 | 0.005453           | 490   | −0.20462
| −0.20126             | 126.205 | 0.005473           | 491   | −0.20203
| −0.19882             | 126.449 | 0.005493           | 492   | −0.19965
| −0.19638             | 126.693 | 0.005512           | 493   | −0.19708
| −0.19394             | 126.937 | 0.005531           | 494   | −0.19489
| −0.1915              | 127.181 | 0.005549           | 495   | −0.19214
| −0.18906             | 127.425 | 0.005566           | 496   | −0.19003
| −0.18662             | 127.669 | 0.005583           | 497   | −0.18729
| −0.18417             | 127.913 | 0.005598           | 498   | −0.18512
| −0.18173             | 128.157 | 0.005614           | 499   | −0.1825
| −0.17929             | 128.401 | 0.005629           | 500   | −0.18036
| −0.17685             | 128.645 | 0.005643           | 501   | −0.1777
| −0.17441             | 128.889 | 0.005657           | 502   | −0.17529
| −0.17197             | 129.133 | 0.00567            | 503   | −0.1727
| −0.16953             | 129.377 | 0.005683           | 504   | −0.17044
| −0.16708             | 129.621 | 0.005695           | 505   | −0.16782
| −0.16464             | 129.865 | 0.005706           | 506   | −0.16541
| −0.1622              | 130.109 | 0.005717           | 507   | −0.16315
| −0.15976             | 130.353 | 0.005727           | 508   | −0.16086
| −0.15732             | 130.597 | 0.005737           | 509   | −0.15817
| −0.15488             | 130.841 | 0.005746           | 510   | −0.15567
| −0.15244             | 131.085 | 0.005754           | 511   | −0.1532
| −0.14999             | 131.329 | 0.005762           | 512   | −0.1507
| −0.14755             | 131.573 | 0.005769           | 513   | −0.14835
| −0.14511             | 131.817 | 0.005775           | 514   | −0.14603
| −0.14267             | 132.061 | 0.005781           | 515   | −0.14374
| −0.14023             | 132.305 | 0.005786           | 516   | −0.14114
| −0.13779             | 132.549 | 0.005791           | 517   | −0.13886
| −0.13535             | 132.793 | 0.005795           | 518   | −0.13614
| −0.1329              | 133.037 | 0.005798           | 519   | −0.13391
| −0.13046             | 133.281 | 0.0058             | 520   | −0.13123
| −0.12802             | 133.525 | 0.005802           | 521   | −0.12891
| −0.12558             | 133.769 | 0.005803           | 522   | −0.1264
| −0.12314             | 134.013 | 0.005804           | 523   | −0.12427
| −0.1207              | 134.257 | 0.005803           | 524   | −0.12158
| −0.11826             | 134.501 | 0.005802           | 525   | −0.1192
| −0.11581             | 134.745 | 0.0058             | 526   | −0.1167
| −0.11337             | 134.989 | 0.005797           | 527   | −0.11435
| −0.11093             | 135.233 | 0.005793           | 528   | −0.11194
| −0.10849             | 135.477 | 0.005789           | 529   | −0.10938
| −0.10605             | 135.721 | 0.005783           | 530   | −0.10675
| −0.10361             | 135.965 | 0.005777           | 531   | −0.10452
| −0.10117             | 136.209 | 0.005769           | 532   | −0.10208
| −0.09872             | 136.453 | 0.005761           | 533   | −0.09982
| −0.09628             | 136.697 | 0.005751           | 534   | −0.09729
| −0.09384             | 136.941 | 0.005739           | 535   | −0.09473
| −0.0914              | 137.185 | 0.005736           | 536   | −0.09222
| −0.08896             | 137.429 | 0.005721           | 537   | −0.08975
| −0.08652             | 137.673 | 0.005703           | 538   | −0.08725
| −0.08408             | 137.917 | 0.005684           | 539   | −0.08487
| −0.08163             | 138.161 | 0.005662           | 540   | −0.08252
| −0.07919             | 138.405 | 0.005638           | 541   | −0.08023
| −0.07675             | 138.649 | 0.005611           | 542   | −0.07767
| −0.07431             | 138.893 | 0.005581           | 543   | −0.0752
| −0.07187             | 139.137 | 0.005549           | 544   | −0.07257
| −0.06943             | 139.381 | 0.005513           | 545   | −0.07019

(continued on next page)
Table 1 (continued)

| Applied Potential (V) | Time (s) | WE (1).Current (A) | Index | WE (1).Potential (V) |
|-----------------------|---------|-------------------|-------|---------------------|
| −0.06699              | 139.625 | 0.005475          | 546   | −0.06769            |
| −0.06454              | 139.869 | 0.005435          | 547   | −0.0654             |
| −0.0621               | 140.113 | 0.005393          | 548   | −0.06308            |
| −0.05966              | 140.357 | 0.005352          | 549   | −0.06058            |
| −0.05722              | 140.601 | 0.00531           | 550   | −0.05814            |
| −0.05478              | 140.845 | 0.005267          | 551   | −0.05548            |
| −0.05234              | 141.089 | 0.005221          | 552   | −0.05307            |
| −0.0499               | 141.333 | 0.00517           | 553   | −0.05054            |
| −0.04745              | 141.577 | 0.005114          | 554   | −0.04813            |
| −0.04501              | 141.821 | 0.005051          | 555   | −0.0449             |
| −0.04257              | 142.065 | 0.004995          | 556   | −0.04241            |
| −0.04013              | 142.309 | 0.004895          | 557   | −0.04015            |
| −0.03769              | 142.533 | 0.004778          | 558   | −0.03764            |
| −0.03525              | 142.797 | 0.004626          | 559   | −0.03503            |
| −0.03281              | 143.041 | 0.004415          | 560   | −0.03243            |
| −0.03037              | 143.285 | 0.004101          | 561   | −0.03004            |
| −0.02792              | 143.529 | 0.003648          | 562   | −0.0277             |
| −0.02548              | 143.773 | 0.003162          | 563   | −0.02532            |
| −0.02304              | 144.017 | 0.002784          | 564   | −0.02288            |
| −0.0206               | 144.261 | 0.002517          | 565   | −0.02041            |
| −0.01816              | 144.505 | 0.002321          | 566   | −0.01797            |
| −0.01572              | 144.749 | 0.002171          | 567   | −0.01531            |
| −0.01328              | 144.993 | 0.002053          | 568   | −0.01286            |
| −0.01083              | 145.237 | 0.00196           | 569   | −0.01051            |
| −0.00839              | 145.481 | 0.001885          | 570   | −0.00816            |
| −0.00595              | 145.725 | 0.001815          | 571   | −0.00572            |
| −0.00351              | 145.969 | 0.001759          | 572   | −0.00338            |
| −0.00107              | 146.213 | 0.001713          | 573   | −0.00081            |
| 0.001373              | 146.457 | 0.001676          | 574   | 0.00159             |

Fig. 1. HR-SEM morphologies of (a) Bare PPMA and (b) PPMA interacted MS surfaces.

Table 2

MS rate of corrosion on CO₂ medium at room temperature.

| ba (V/dec) | bc (V/dec) | Ecorr, Calc (V) | Ecorr, Obs (V) | jcorr. (A/cm²) | icorr. (A) | Corrosion rate (mm/year) | Polarization resistance (Ω) | E Begin (V) | E End (V) |
|------------|------------|-----------------|----------------|----------------|------------|--------------------------|-----------------------------|--------------|-----------|
| 0.17394    | 0.045221   | −0.35222        | −0.35938       | 0.000221       | 0.000221   | 2.5625                   | 70.681                      | −0.4454      | −0.32333  |
2. Experimental Design, Materials and Methods

2.1. Materials

1-(pyridin-2-yl)piperazine, 98.0%; 1-[(4-nitrophenyl)methyl]-4-(pyridin-2-yl)piperazine, 98%; 4-nitrobenzaldehyde, 98.5%; 1,2-dichloroethane were bought from AAPPTEC, USA. Sodiumtriacetoxyborohydride, 99.0%; and other reagents and solvents were purchased from HiMedia Laboratories Pvt. Ltd. (Mumbai, India). Every one of the chemicals was used without auxiliary purification. The entire aqueous solutions to be prepared by nanopure water. All equipment and glassware’s are washed through acetone, rinsed by deionized water (DIW) and dehydrated with air searing owan at 100 °C, then it was used throughout the studies.

2.2. Synthesis of 4-[[4-(pyridin-2-yl)piperazin-1-yl]methyl]aniline (PPMA)

The solution of 1-[(4-nitrophenyl)methyl]-4-(pyridin-2-yl)piperazine (NMPP) Scheme S1 (6 g, 0.020 mol) reported in 50 mL 12N HCl, SnCl2 .2H2O (18.1 g, 0.080 mol) was added portion wise at RT [2,7]. The resulting reaction mass was stirred at RT for 2 h, See Scheme 1. The progress of the reaction was monitored by TLC in Fig. 3. The reaction mixture was diluted with 250 mL of cold water. The solution was basified to pH 9–10 with 40% NaOH and the aqueous layer was extracted with ethyl acetate (3 × 250 mL), washed with water (2 × 250 mL), brine (1 × 300 mL) and dried over anhydrous Na2SO4. The solvent was concentrated under reduced pressure to give the titled compound. Light brown solid; 4.73 g. In this product is used as a catalyst for corrosion inhibition for mild steel at elevated temperature in CO2 medium.
2.3. Characterization techniques

The high resolution scanning electron microscopy (HR-SEM) was carried out on a FEI Quanta FEG 200 instrument facility at 25 °C. The taster was equipped by introduce a minute amount of primed material on a carbon coated copper network and allowing the solvent to evaporate. FT-IR spectra were recorded with thermo scientific spectrometer, model no. iS5 equipped with attenuated total reflectance (ATR) competence which is implemented by Zn-Se crystal detector. Each spectrum was recorded with an achievement time of 18 s. The FT-IR dimension was scanned at a range from 4000 to 400 cm\(^{-1}\).

Interpretation of FT-IR and NMR spectral data of PPMA is mainly focused on the MS interaction with PPMA vibrations at 408.0 cm\(^{-1}\) indicate that C-N-O bending, and 3150.4, 3270.0 cm\(^{-1}\) represent the NH and NH\(_2\) stretching vibrations is confirmed by the PPMA adsorbed on the MS surfaces (see Supporting Information Table S1).

Ethics Statement

This article conforms to Elsevier’s standards of ethical publishing.

Data Availability

The data is available with this article.
Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

CRediT Author Statement

Raman Govindhan: Conceptualization, Writing – original draft, Supervision; Srinivasan Anbalagan: Conceptualization, Data curation, Methodology; Meenakshisundaram Ravishankar: Writing – review & editing.

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Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.dib.2021.107492.

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