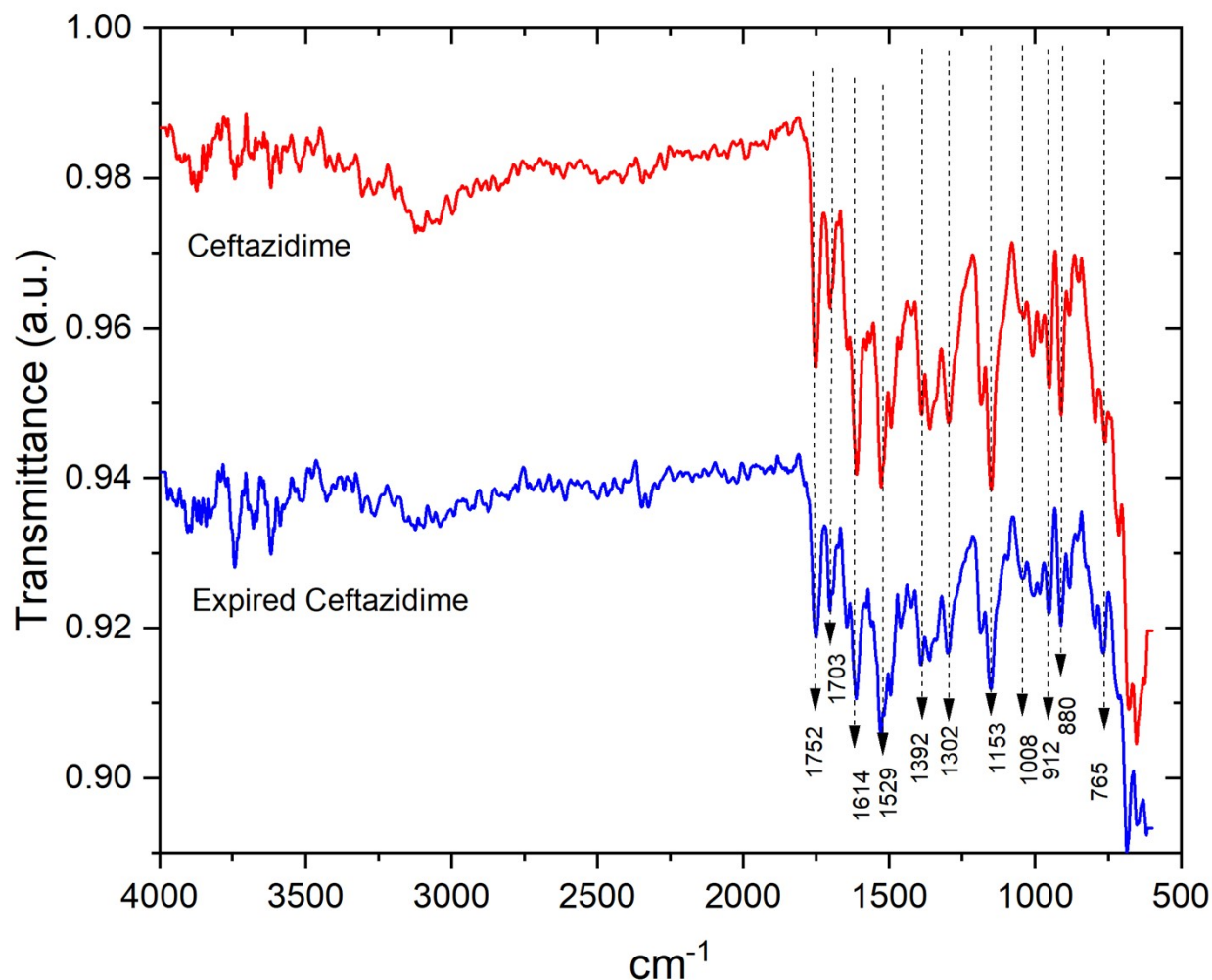
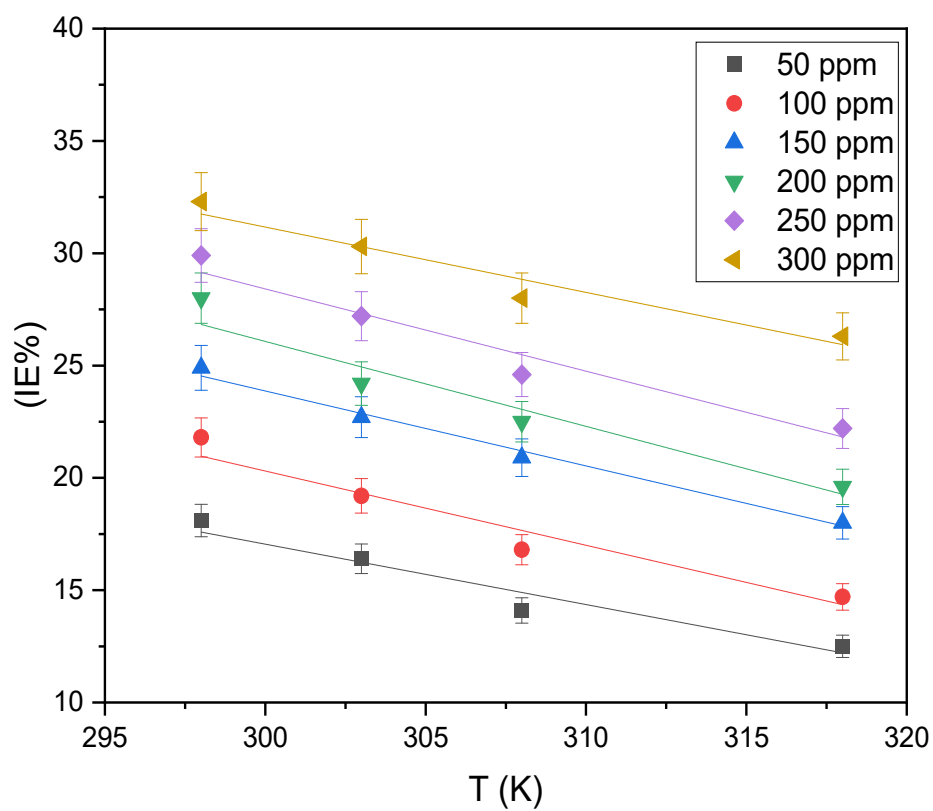




**Fig. S1** FTIR spectra of fresh Ceftazidime and expired Ceftazidime (expired 1 year ago)

Both the expired and fresh Ceftazidime show nearly identical FTIR spectrum with the same function group vibration bands. The intense band at 1752 cm<sup>-1</sup> was attributed to the C=O stretching vibration of the  $\beta$ -lactam ring, the key functional group in Ceftazidime. The band at 1703 cm<sup>-1</sup> corresponds to the C=O stretching vibration of the carboxylic acid group (COO<sup>-</sup>). The C=N stretching vibration of the thiazole ring appears at 1614 cm<sup>-1</sup>. The band at 1529 cm<sup>-1</sup> was associated with the N-H bending vibration of the amide group and the C=C stretching of the aromatic ring.

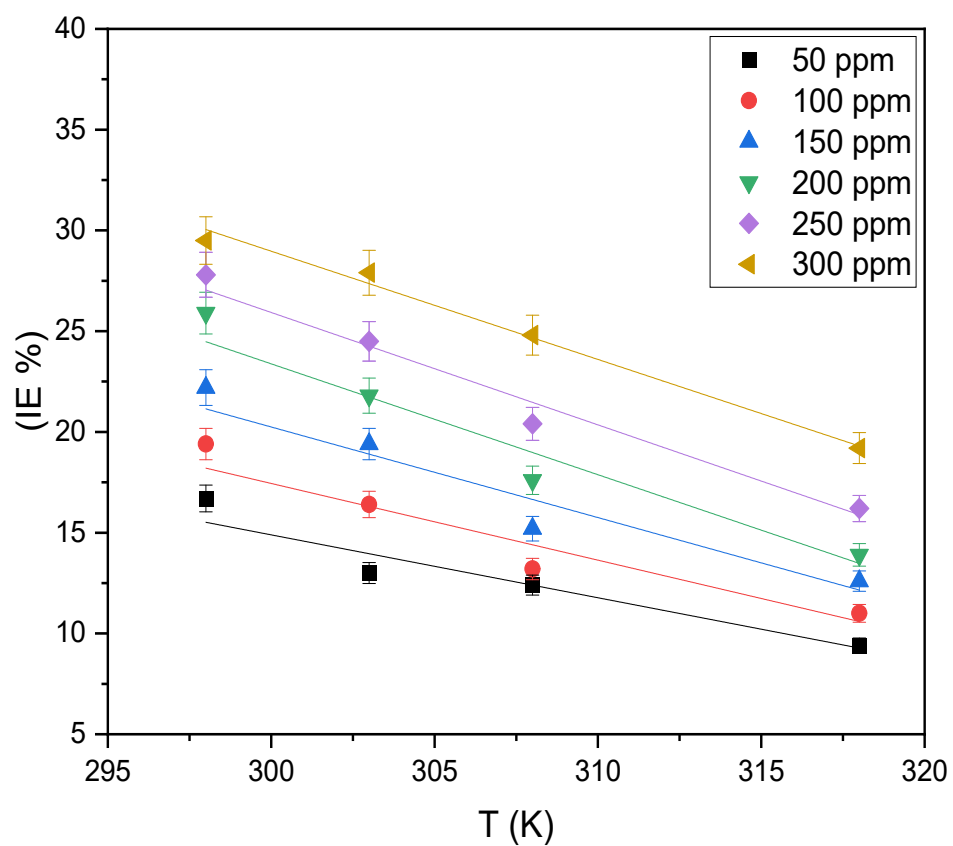
The C-N stretching vibration of the amide group appears at 1302 cm<sup>-1</sup>. The band at 1008 cm<sup>-1</sup> was due to the C-O-C stretching vibration, further confirming the presence of ether linkages in the structure. The presence of aromatic ring is confirmed by the presence of band at 912 cm<sup>-1</sup>, which is due to the out-of-plane bending vibration of the C-H group in the aromatic ring. The bands at 880 cm<sup>-1</sup> and 765 cm<sup>-1</sup> is due to C-H out-of-plane bending and C-S stretching vibration in the thiazole ring, respectively.



**Fig. S2** Effect of temperature on  $IE_w$  at different concentrations of Ceftazidime (expired 2 years ago) for zinc corrosion in  $1 \text{ mol L}^{-1} \text{ HCl}$

**Table S1** Data of WL measurements at 240 min for zinc in a 1 mol L<sup>-1</sup> HCl, in the absence and presence of different concentrations of the Ceftazidime drug (expired 2 years ago) at different temperatures.

| Temp.<br>(K) | Dose of drug<br>(ppm) | Weight loss<br>(mg cm <sup>-2</sup> ) | CR × 10 <sup>-3</sup><br>(mg cm <sup>-2</sup> min <sup>-1</sup> ) | Surface<br>coverage<br>(θ) | IE <sub>w</sub><br>(%) |
|--------------|-----------------------|---------------------------------------|-------------------------------------------------------------------|----------------------------|------------------------|
| 298          | 0.00                  | 7.11                                  | 25.45                                                             | –                          | –                      |
|              | 50                    | 5.82                                  | 20.87                                                             | 0.181                      | 18.1 ± 0.2             |
|              | 100                   | 5.56                                  | 19.85                                                             | 0.218                      | 21.8 ± 0.1             |
|              | 150                   | 5.34                                  | 19.08                                                             | 0.249                      | 24.9 ± 0.1             |
|              | 200                   | 5.12                                  | 18.32                                                             | 0.280                      | 28.0 ± 0.2             |
|              | 250                   | 4.98                                  | 18.30                                                             | 0.299                      | 29.9 ± 0.3             |
|              | 300                   | 4.81                                  | 17.23                                                             | 0.323                      | 32.3 ± 0.2             |
| 303          | 0.00                  | 8.22                                  | 34.25                                                             | -                          | -                      |
|              | 50                    | 6.87                                  | 28.63                                                             | 0.164                      | 16.4 ± 0.3             |
|              | 100                   | 6.64                                  | 27.67                                                             | 0.192                      | 19.2 ± 0.2             |
|              | 150                   | 6.35                                  | 26.48                                                             | 0.227                      | 22.7 ± 0.1             |
|              | 200                   | 6.23                                  | 25.96                                                             | 0.242                      | 24.2 ± 0.2             |
|              | 250                   | 5.98                                  | 24.93                                                             | 0.272                      | 27.2 ± 0.3             |
|              | 300                   | 5.73                                  | 23.87                                                             | 0.303                      | 30.3 ± 0.1             |
| 308          | 0.00                  | 9.70                                  | 38.29                                                             | -                          | -                      |
|              | 50                    | 8.33                                  | 32.89                                                             | 0.141                      | 14.1 ± 0.1             |
|              | 100                   | 8.07                                  | 31.86                                                             | 0.168                      | 16.8 ± 0.2             |
|              | 150                   | 7.67                                  | 30.29                                                             | 0.209                      | 20.9 ± 0.3             |
|              | 200                   | 7.52                                  | 29.67                                                             | 0.225                      | 22.5 ± 0.1             |
|              | 250                   | 7.31                                  | 28.88                                                             | 0.246                      | 24.6 ± 0.1             |
|              | 300                   | 6.98                                  | 27.56                                                             | 0.280                      | 28.0 ± 0.2             |
| 318          | 0.00                  | 10.65                                 | 49.79                                                             | -                          | -                      |
|              | 50                    | 9.32                                  | 43.57                                                             | 0.125                      | 12.5 ± 0.1             |
|              | 100                   | 9.08                                  | 42.47                                                             | 0.147                      | 14.7 ± 0.2             |
|              | 150                   | 8.73                                  | 40.82                                                             | 0.180                      | 18.0 ± 0.1             |
|              | 200                   | 8.56                                  | 40.03                                                             | 0.196                      | 19.6 ± 0.3             |
|              | 250                   | 8.29                                  | 38.73                                                             | 0.222                      | 22.2 ± 0.1             |
|              | 300                   | 7.85                                  | 36.70                                                             | 0.263                      | 26.3 ± 0.2             |



**Fig. S3** Effect of temperature on  $IE_w$  at different concentrations of Ceftazidime (expired 3 years ago) for zinc corrosion in  $1 \text{ mol L}^{-1} \text{ HCl}$

**Table S2** Data of WL measurements at 240 min for zinc in a 1 mol L<sup>-1</sup> HCl, in the absence and presence of different concentrations of the Ceftazidime drug (expired 3 years ago) at different temperatures.

| Temp.<br>(K) | Dose of drug<br>(ppm) | Weight loss<br>(mg cm <sup>-2</sup> ) | CR × 10 <sup>-3</sup><br>(mg cm <sup>-2</sup> min <sup>-1</sup> ) | Surface<br>coverage<br>(θ) | IE <sub>w</sub><br>(%) |
|--------------|-----------------------|---------------------------------------|-------------------------------------------------------------------|----------------------------|------------------------|
| 298          | 0.00                  | 7.11                                  | 25.45                                                             | –                          | –                      |
|              | 50                    | 5.92                                  | 21.30                                                             | 0.167                      | 16.7 ± 0.1             |
|              | 100                   | 5.73                                  | 20.51                                                             | 0.194                      | 19.4 ± 0.2             |
|              | 150                   | 5.53                                  | 19.80                                                             | 0.222                      | 22.2 ± 0.3             |
|              | 200                   | 5.27                                  | 18.86                                                             | 0.259                      | 25.9 ± 0.1             |
|              | 250                   | 5.13                                  | 18.53                                                             | 0.278                      | 27.8 ± 0.1             |
|              | 300                   | 5.01                                  | 17.94                                                             | 0.295                      | 29.5 ± 0.1             |
| 303          | 0.00                  | 8.22                                  | 34.25                                                             | -                          | -                      |
|              | 50                    | 7.15                                  | 29.80                                                             | 0.130                      | 13.0 ± 0.2             |
|              | 100                   | 6.87                                  | 28.63                                                             | 0.164                      | 16.4 ± 0.1             |
|              | 150                   | 6.62                                  | 27.61                                                             | 0.194                      | 19.4 ± 0.1             |
|              | 200                   | 6.43                                  | 26.78                                                             | 0.218                      | 21.8 ± 0.3             |
|              | 250                   | 6.21                                  | 25.86                                                             | 0.245                      | 24.5 ± 0.2             |
|              | 300                   | 5.93                                  | 24.69                                                             | 0.279                      | 27.9 ± 0.1             |
| 308          | 0.00                  | 9.70                                  | 38.29                                                             | -                          | -                      |
|              | 50                    | 8.50                                  | 33.54                                                             | 0.124                      | 12.4 ± 0.2             |
|              | 100                   | 8.42                                  | 33.24                                                             | 0.132                      | 13.2 ± 0.1             |
|              | 150                   | 8.23                                  | 32.47                                                             | 0.152                      | 15.2 ± 0.2             |
|              | 200                   | 7.99                                  | 31.55                                                             | 0.176                      | 17.6 ± 0.3             |
|              | 250                   | 7.72                                  | 30.48                                                             | 0.204                      | 20.4 ± 0.1             |
|              | 300                   | 7.29                                  | 28.79                                                             | 0.248                      | 24.8 ± 0.2             |
| 318          | 0.00                  | 10.65                                 | 49.79                                                             | -                          | -                      |
|              | 50                    | 9.64                                  | 45.11                                                             | 0.094                      | 9.4 ± 0.1              |
|              | 100                   | 9.48                                  | 44.31                                                             | 0.110                      | 11.0 ± 0.2             |
|              | 150                   | 9.31                                  | 43.52                                                             | 0.126                      | 12.6 ± 0.1             |
|              | 200                   | 9.17                                  | 42.86                                                             | 0.139                      | 13.9 ± 0.2             |
|              | 250                   | 8.93                                  | 41.72                                                             | 0.162                      | 16.2 ± 0.1             |
|              | 300                   | 8.61                                  | 39.93                                                             | 0.192                      | 19.2 ± 0.2             |