INTRODUCTION

Corrosion is a common problem in petroleum industries. Corrosion of carbon steel in the presence of saline water from oil. Source wells is a common problem across many petroleum industries. Saline water from oil source wells contain corrosive species. Such as chlorides and also high levels of dissolved solids. Corrosion is devised on the surface of the metal and forms a protective thin film; a formation of a protective film by oxide protection of the base metal; and reacting with a potential corrosive component present in aqueous media and the product is a complex.

Unfortunately, most organic inhibitors are inherently toxic and potential health hazards, such as the carcinogenic effect of aromatic heterocyclic compounds on humans. The use of inorganic inhibitors as an alternative to organic compounds is based on the possibility of degradation of organic compounds with time and temperature. This tempted many researchers to investigate the feasibility of application of new synthetics inorganic compounds (phosphites) as inhibitors in corrosive solution. A phosphate in inorganic chemistry is a salt of phosphorous acid. Historically, Phosphate has referred to salts containing HPO$_4$$^2$-.[16] Also natural products can also be used as corrosion inhibitors. These extracts are non toxic and easily available. The present work in undertaken to investigate the corrosion resistance of mild steel in simulated oil well water in the absence and presence of aqueous extract of Brown Indian Hemp leaves and Asafoetida by AC impedance spectra.

MATERIALS AND METHODS

1. Simulated oil well water

Simulated oil well water was prepared by the following method. 3.5g of NaCl 0.305g of CaCl$_2$ and 0.186g of MgCl$_2$ were dissolved in 100 ml of water. Just before the experiment, 0.067g of Sodium sulphide and 0.4ml of Con. HCl were added. Thus H$_2$S gas was generated (100 ppm of H$_2$S). Then AC impedance spectrum study was carried out with their solution.

2. Preparation of Extract

2.1 Brown Indian Hemp Leaves extract

Brown Indian Hemp Leaves were dried in the air shade. 100 g of the Brown Indian Hemp Leaves were boiled with DD water. The suspended impurities were removed. The extract was made up to 100 ml. This solution was used as inhibitor.
2.2 Asafoetida extract
1 g of Asafoetida powder was added to 100 ml of oil well water.

Figure 2: AC impedance spectrum (Nyquist plot) of mild steel immersed in Simulated oil well water and 20 ml of green extract.
Figure 3: AC impedance spectrum of mild steel immersed in Simulated oil well water and Asafoetida extract.

FIGURE 4: AC impedance spectrum of mild steel immersed in Simulated oil well water
Figure 5: AC impedance spectrum of (Bode plot) mild steel immersed in SOWW and 20 ml of green extract.

Figure 6: ac impedance spectrum of (bode plot) mild steel immersed in soww and asafoetida extract.
Figure 7: AC impedance spectrum (Nyquist plot) of SS316L immersed in SOWW.

Figure 8: AC impedance spectrum (Nyquist plot) of SS316L immersed in SOWW and 20 ml of green extract.

Figure 9: AC impedance spectrum (Nyquist plot) of SS316L immersed in SOWW and Asafoetida extract.
Figure 10: AC Impedance Spectrum (Bode Plot) Of SS316L Immersed In SOWW.

Figure 11: AC impedance spectrum (Bode plot) of SS316L immersed in SOWW and 20 ml of green extract.
RESULTS AND DISCUSSION

The corrosion resistance of mild steel and SS316L alloy immersed in simulated oil well water (SOWW) in the absence and presence of corrosion inhibitors such as aqueous extract of Brown Indian Hemp Leaves (Green leaves) and Asafoetida powder has been evaluated by AC impedance spectra. The AC impedance spectra are shown in Figures. The corrosion parameters such as charge transfer resistance ($R_t$) and double layer capacitance ($C_{dl}$) derived from Nyquist plots, and impedance value derived from Bode plots are given in Tables 1 and 2.

Tables 1: AC impedance parameters of mild steel immersed in various test solutions.

<table>
<thead>
<tr>
<th>Systems</th>
<th>$R_t$ (Ohm cm$^2$)</th>
<th>$C_{dl}$ (F/cm$^2$)</th>
<th>Impedance Log (Z/ohm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOWW</td>
<td>253</td>
<td>201.84x10$^{-10}$</td>
<td>2.558</td>
</tr>
<tr>
<td>SOWW + Green leaves 20 ml</td>
<td>2389</td>
<td>21.34 x 10$^{-10}$</td>
<td>3.528</td>
</tr>
<tr>
<td>SOWW + Asafoetida (1g)</td>
<td>5494</td>
<td>9.282x10$^{-10}$</td>
<td>3.884</td>
</tr>
</tbody>
</table>

Mild Steel System

It is observed from Table 1 that when Green leaves extract is added to simulated oil well water, the corrosion resistance of mild steel increases. This is revealed by the fact, that when green leaves extract is added, $R_t$ value increases, $C_{dl}$ value decreases and impedance value increases.

Similarly, when Asafoetida extract is added, the corrosion resistance of mild steel increases. This is revealed by the fact, that when green leaves extract is added, $R_t$ value increases, $C_{dl}$ value decreases and impedance value increases.

Thus, it is inferred from AC impedance spectra that in presence of Green leaves extract and Asafoetida extract the corrosion resistance of mild steel in simulated oil well water increases.

It is also inferred that Asafoetida offers better corrosion inhibition than green leaves to mild steel as revealed by the fact that for Asafoetida system, the $R_t$ value is higher than that of green leaves system.

Table 2: AC impedance parameters of SS316L immersed in various test solutions.

<table>
<thead>
<tr>
<th>Systems</th>
<th>$R_t$ (Ohm cm$^2$)</th>
<th>$C_{dl}$ (F/cm$^2$)</th>
<th>Impedance log (Z/ohm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOWW</td>
<td>6965</td>
<td>7.3223x10$^{-10}$</td>
<td>3.656</td>
</tr>
<tr>
<td>SOWW + Green leaves (20 ml)</td>
<td>7590</td>
<td>6.7191x10$^{-10}$</td>
<td>4.074</td>
</tr>
<tr>
<td>SOWW + Asafoetida (1g)</td>
<td>7879</td>
<td>6.4729x10$^{-10}$</td>
<td>4.081</td>
</tr>
</tbody>
</table>
SS316L System
It is observed from Table 2 that when green leaves extract is added to simulated oil well water, the corrosion resistance of mild steel increases. This is revealed by the fact, that when green leaves extract is added, $R_t$ value increases, $C_{dl}$ value decreases and impedance value increases.

Similarly, when Asafoetida extract is added, the corrosion resistance of SS316L increases. This is revealed by the fact, that when green leaves extract is added, $R_t$ value increases, $C_{dl}$ value decreases and impedance value increases.

Thus, it is inferred from AC impedance spectra that in presence of green leaves extract and Asafoetida extract the corrosion resistance of SS316L in simulated oil well water increases.

It is also inferred that Asafoetida offers better corrosion inhibition than green leaves to SS316L as revealed by the fact that for Asafoetida system, the $R_t$ value is higher than that of green leaves system.

CONCLUSION
The corrosion resistance of mild steel and SS316L alloy immersed in simulated oil well water (SOWW) in the absence and presence of corrosion inhibitors such as aqueous extract of Brown Indian Hemp Leaves (Green leaves) and Asafoetida powder has been evaluated by AC impedance spectra.

It is observed that both green leaves extract and Asafoetida extract offer corrosion protection to mild steel and SS316L in simulated oil well water.

SS316L offer better corrosion inhibition than mild steel. This finding will be useful in petroleum industry.

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REFERENCES