

## INDEX OF TABLES

Page No.

### CHAPTER - I

1. Production of ammonia by developing and developed countries for 1989-90	29
2. Carbon dioxide produced in generating synthesis gas from different feed stocks	29
3. Typical composition of GV glycine solution	30
4. Typical composition of the synthesis gas before and after removal of carbon dioxide using GV glycine	30
5. Typical composition of the GV solution	31
6. Typical composition of the synthesis gas before and after removal of carbon dioxide using GV	31
7. Typical composition of Benfield solution	32
8. Typical composition of the synthesis gas before and after removal of carbon dioxide using Benfield	32

### CHAPTER - III

1. Chemical analysis of the carbon steel working electrode	86
2. Chemical analysis of the plant and synthetic GV solutions	86

### CHAPTER - IV

1. Open circuit potential of carbon steel in different GV solutions	162
2. Critical current density, passive current density, passive potential and primary passivating potential values for CS in GV solutions	165
3. Anodic tafel, cathodic tafel and corrosion current density values for CS in GV solutions	168
4. Polarisation resistance, corrosion rate and inhibitor efficiency values for CS in GV solutions	171
5. Polarisation resistance, double layer capacitance values derived from AC impedance study for CS in GV solutions	174
6. Chemical analysis of the plant GV semi lean solution and date of sampling	175

## INDEX OF FIGURES

Page No.

### CHAPTER - I

1. Flow diagram for carbon dioxide removal system split stream method 33
2. Schematic i-E curves showing range of max. susceptibility to SCC for steel in carbonate/bicarbonate solution 33
3. Hypothetical cathodic and anodic polarization diagram showing tafel regions 34
4. Hypothetical cathodic and anodic polarization plots for a passive metal 34

### CHAPTER - II

1. Crack profile depicting the dimensions of the crack after grinding 64

### CHAPTER - III

1. Schematic potentiodynamic polarization wiring diagram 87
2. Schematic alternating current impedance wiring diagram 87
3. A) Equivalent circuit for corrosion of steel in inhibited aqueous solution 88  
B) Typical Nyquist plot  
C) Typical Bode plot
4. Standard polarisation cell experimental set up used in polarization and AC impedance studies 89

### CHAPTER - IV

1. Potentiodynamic polarization scans of CS in plant GV solutions 176
2. Potentiodynamic polarization scans of CS in plant GVSL solution (without aeration) 177
3. Potentiodynamic polarization scans of CS in plant GVSL solution (with aeration) 178
4. Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.1% vanadium pentoxide 179

5.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.7% pot. dichromate	180
6.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.6% sod. silicate and 0.02% pot. dichromate	181
7.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 1% amm. metavanadate and 0.25% sod. nitrite	182
8.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.1% amm. metavanadate, 0.1% pot. ant. tartrate and 0.01% tartaric acid	183
9.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution	184
10.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.075% antimony trioxide	185
11.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.1% antimony trioxide	186
12.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.13% antimony trioxide	187
13.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.14% antimony trioxide	188
14.	Effect of ferric ions on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.15% antimony trioxide	189
15.	Effect of antimony trioxide on the potentiodynamic polarization scans of CS in synthetic GVSL solution without ferric ions	190
16.	Effect of antimony trioxide on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.01% ferric ions	191
17.	Effect of antimony trioxide on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.02% ferric ions	192

18.	Effect of antimony trioxide on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.03% ferric ions	193
19.	Effect of antimony trioxide on the potentiodynamic polarization scans of CS in synthetic GVSL solution with 0.04% ferric ions	194
20.	OCP of CS in GV solution with 0.1% vanadium pentoxide	195
21.	OCP of CS in GV solution with 0.7% pot. dichromate	195
22.	OCP of CS in GV solution with 0.6% sod. silicate and 0.02% pot. dichromate	196
23.	OCP of CS in GV solution with 1% amm. metavanadate and 0.25% sod. nitrite	196
24.	OCP of CS in GV solution with 0.1% amm. metavanadate and 0.1% pot. antimonyl tartrate and 0.01% tartaric acid	197
25.	OCP of CS in GV solution without antimony trioxide	198
26.	OCP of CS in GV solution with 0.075% antimony trioxide	198
27.	OCP of CS in GV solution with 0.1% antimony trioxide	199
28.	OCP of CS in GV solution with 0.13% antimony trioxide	199
29.	OCP of CS in GV solution with 0.14% antimony trioxide	200
30.	OCP of CS in GV solution with 0.15% antimony trioxide	200
31.	Bode and Nyquist plots for CS in synthetic GVSL solution without inhibitors	201
32.	Bode and Nyquist plots for CS in synthetic GVSL solution with 0.15% antimony trioxide	202
33.	Bode and Nyquist plots for CS in synthetic GVSL solution with 0.01% ferric ions	203
34.	Bode and Nyquist plots for CS in synthetic GVSL solution with 0.15% antimony trioxide and 0.01% ferric ions	204
35.	Bode and Nyquist plots for CS in synthetic GVSL solution with 0.02% ferric ions	205
36.	Bode and Nyquist plots for CS in synthetic GVSL solution with 0.15% antimony trioxide and 0.02% ferric ions	206

37. Bode and Nyquist plots for CS in synthetic GVSL solution with 0.03% ferric ions	207
38. Bode and Nyquist plots for CS in synthetic GVSL solution with 0.15% antimony trioxide and 0.03% ferric ions	208
39. Bode and Nyquist plots for CS in synthetic GVSL solution with 0.04% ferric ions	209
40. Bode and Nyquist plots for CS in synthetic GVSL solution with 0.15% antimony trioxide and 0.04% ferric ions	210
41. Effect of ferric ions and antimony trioxide on polarization resistance	211
42. Effect of ferric ions and antimony trioxide on double layer capacitance	211

#### CHAPTER - V

1. Polarity convention for oxidation - reduction cells	253
2. Activation polarisation of a reversible electrode	254
3. Idealized representation of the effect of external current on a mixed control corrosion cell	255
4. Potential - pH Equilibrium diagram for the system iron - water, at 25 Deg. C	256
5. Pourbaix diagrams showing passivity, immunity and corrosion zones and effect of change in environments	256
6. Principal phases observed on steel surfaces after exposure to various solutions at different potentials	257
7. Effects of solution pH on the potentials of the first oxidation and reduction peaks observed on steel surfaces in potentiodynamic tests at 75 Deg. C	257
8. Relationship between pH/ potential conditions for severe cracking susceptibility of steel in various environments and the stability regions for different species	258
9. Schematic electrode potential/ current density relationships for (a) 'poorly' passivating and (b) 'strongly' passivating systems	258