Claims

1. A method for operating an acid gas treatment unit with reduced corrosion by the *in situ* generation of polysulfide ions comprising:

(a) contacting an acid gas stream containing H_2S with an aqueous alkaline absorbent solution to absorb the H_2S into the solution to form a providing a process stream including HS^- and/or S^{2-} ions; and

(b) subjecting the stream containing the HS^- and/or S^{2-} ions to electrochemical oxidation to oxidize the HS- and/or S^{2-} ions to generate polysulfide ions, and

(c) regenerating the aqueous alkaline absorbent solution to release acid gas components from the solution.

2. The method of claim 1 in which the acid gas stream fluid stream also comprises at least one of CO_2, SO_2, SO_3, CS_2, HCN, COS or a C_1-C_4 thiol.

3. The method of claim 1 in which the aqueous alkaline absorbent solution includes at an alkanolamine, a metal hydroxide, a metal carbonate, a metal hydrated oxide, a metal bicarbonate, ammonium or amine cations.

4. The method of claim 1 in which the aqueous alkaline absorbent solution includes a sterically hindered aminoether compound having a degree of steric hindrance such that the cumulative -Es value (Taft's steric hindrance constant) is greater than 1.75.

5. The method of claim 1 in which the aqueous alkaline absorbent solution includes an alkanolamines selected from monoethanolamine (MEA), diethanolamine (DEA), triethanolamine (TEA), dipropanolamine (DPA), diisopropanolamine (DIPA), methyldiethanolamine (MDEA), or diethylmonoethanolamine (DEAE).

6. The method of claim 1 in which the aqueous alkaline absorbent solution is contained in an acid gas treatment unit having a metal surface which the polysulfide ions contact to form metal-polysulfide on the metal surface to ameliorate corrosion of the metal surface.

7. The method of claim 1 in which the acid gas stream includes mercury which is reacted with the polysulfide ions in the aqueous alkaline absorbent solution

stream to form mercury sulfide which is filtered from the aqueous alkaline absorbent solution stream.

8. The method of claim 1 in which the acid gas process stream includes cyanide ionswhich are reacted with the polysulfide ions in the aqueous alkaline absorbent solution stream to form thiocyanate ions, to create benign thiocyanate.

9. The method of claim 1 in which the acid gas process stream includes arsinewhich is reacted with the polysulfide ions in the aqueous alkaline absorbent solution stream to react to form arsenic trisulfide which is filtered from the aqueous alkaline absorbent solution stream.

10. The method of claim 1 in which the stream containing the HS^- and/or S^{2-} ions is subjected to electrochemical oxidation in the anode compartment of an electrochemical cell.

11. The method of claim 1 in which the acid gas stream containing H_2S is contacted with the aqueous alkaline absorbent solution in a carbon steel gas treatment unit.

12. The method of claim 1 in which the aqueous alkaline absorbent solution contains a total concentration of heat stable salts in excess of 0.5 wt. percent of the solution.

13. The method of claim 12 in which the aqueous alkaline absorbent solution contains a total concentration of heat stable salts in excess of 3 wt. percent of the solution.

14. The method of claim 1 in which the aqueous alkaline absorbent solution includes monoethanolamine (MEA) at a concentration exceeding 25 wt. percent of the solution.

15. The method of claim 1 in which the aqueous alkaline absorbent solution includes diethanolamine (DEA) at a concentration exceeding 25 wt. percent of the solution.

16. The method of claim 1 in which the aqueous alkaline absorbent solution includes and alkanolamines selected from monoethanolamine (MEA) or diethanolamine (DEA) and the process stream including HS- and/or S_2- ions contains 0.5-0.7 moles acid gas / mole alkanolamine.

CLAIMS:

1. A method for operating an acid gas treatment unit with reduced corrosion by the in situ generation of polysulfide ions comprising:

(a) contacting an acid gas stream containing H_2S with an aqueous alkaline absorbent solution to absorb the H_2S into the solution to form a process stream including HS and/or S_2-ions; and

(b) subjecting the stream containing the HS- and/or S_2-ions to electrochemical oxidation to oxidize the HS- and/or S2-ions to generate polysulfide ions, and

(c) regenerating the aqueous alkaline absorbent solution to release acid gas components from the solution;

wherein the aqueous alkaline absorbent solution is contained in an acid gas treatment unit having a metal surface which the polysulfide ions contact to form metal-polysulfide on the metal surface to ameliorate corrosion of the metal surface.

2. The method of claim 1 in which the acid gas stream fluid stream also comprises at least one of CO_2, SO_2, SO_3, CS_2, HCN, COS or a C1-C4 thiol.

3. The method of claim 1 in which the aqueous alkaline absorbent solution includes an alkanolamine, a metal hydroxide, a metal carbonate, a metal hydrated oxide, a metal bicarbonate, ammonium or amine cations.

4. The method of claim 1 in which the aqueous alkaline absorbent solution includes a sterically hindered aminoether compound having a degree of steric hindrance such that the cumulative -Es value (Taft's steric hindrance constant) is greater than 1.75.

5. The method of claim 1 in which the aqueous alkaline absorbent solution includes an alkanolamines selected from monoethanolamine (MEA), diethanolamine (DEA), triethanolamine (TEA), dipropanolamine (DPA), diisopropanolamine (DIPA), methyldiethanolamine (MDEA), or diethylmonoethanolamine (DEAE).

6. The method of claim 1 in which the acid gas stream includes mercury which is reacted with the polysulfide ions in the aqueous alkaline absorbent solution stream to form mercury sulfide which is filtered from the aqueous alkaline absorbent solution stream.

7. The method of claim 1 in which the acid gas process stream includes cyanide ions which are reacted with the polysulfide ions in the aqueous alkaline absorbent solution stream to form thiocyanate ions, to create benign thiocyanate.

8. The method of claim 1 in which the acid gas process stream includes arsine which is reacted with the polysulfide ions in the aqueous alkaline absorbent solution stream to react to form arsenic trisulfide which is filtered from the aqueous alkaline absorbent solution stream.

9. The method of claim 1 in which the stream containing the HS- and/or S_2-ions is subjected to electrochemical oxidation in the anode compartment of an electrochemical cell.

10. The method of claim 1 in which the acid gas stream containing H_2S is contacted with the aqueous alkaline absorbent solution in a carbon steel gas treatment unit.

11. The method of claim 1 in which the aqueous alkaline absorbent solution contains a total concentration of heat stable salts in excess of 0.5 wt. percent of the solution.

12. The method of claim 11 in which the aqueous alkaline absorbent solution contains a total concentration of heat stable salts in excess of 3 wt. percent of the solution.

13. The method of claim 1 in which the aqueous alkaline absorbent solution includes monoethanolamine (MEA) at a concentration exceeding 25 wt. percent of the solution.

14. The method of claim 1 in which the aqueous alkaline absorbent solution includes diethanolamine (DEA) at a concentration exceeding 25 wt. percent of the solution.

15. The method of claim 1 in which the aqueous alkaline absorbent solution includes and alkanolamines selected from monoethanolamine (MEA) or diethanolamine (DEA) and the process stream including HS- and/or S_2-ions contains 0.5-0.7 moles acid gas/mole alkanolamine.