86-075551/11 E35 H09 J01 (E17 H06) SHEL 24.12.84
SHELL OIL CO *US 4572-826-A
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Removal of hydrogen cyanide from gas stream - by contact successively with aq. aldehyde and aq. polysulphide solns.

C86-032359

Hydrogen cyanide is removed from a gas stream by (a) contacting the stream with an aldehyde R-CHO (where R = H or 1-3 C alkyl) or a precursor thereof under conditions to remove the bulk of the HCN and produce a stream of reduced HCN content; and (b) contacting the latter with an aq. soln. contg. ammonium polysulphide and/or sodium polysulphide under conditions to convert HCN, and produce a stream further reduced in HCN content.

USE/ADVANTAGE

The method is used to treat gas from coal gasification; it provides an optimum balance of prevention of cyanide complex formation, corrosion protection and effluent salt content adjustment.

OPTIONAL FEATURES

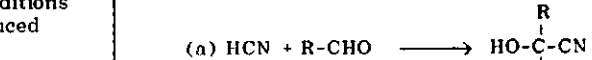
Formaldehyde or paraformaldehyde is used in step (a), at 100-270°C, 300-600 psig. pH 6-9.

The polysulphide in step (b) is 0.01-0.05 moles/l, 25-110 °C., pH 7-9; elemental sulphur may be added.

Ammonium thiocyanate produced may be hydrolysed, e.g. at 200-300°C., gases stripped out, and finally biotreated in a nitrifying-denitrifying environment; alternatively NaOH may be added to release ammonia for recycle or recovery, and the thiocyanate destroyed by biotreatment (to produce sodium sulphate solution, nitrogen and carbon dioxide).

REACTIONS

The reactions for the process may be shown as follows:



(a) $HCN + R\text{-}CHO \longrightarrow HO\text{-}C(R)(H)\text{-}CN$

(b) $HCN + (NH_4)_2S_x + NH_3 \longrightarrow NH_4SCN + (NH_4)_2S_{x-1}$

or $HCN + Na_2S_x + NaOH \longrightarrow NaSCN + Na_2S_{x-1} + H_2O$

(where x = 2-5).

E(32-B) H(9-D) J(1-E3)

EXAMPLE

The bulk of the fly ash was removed from a gas stream from the partial combustion of coal, the gas containing by wt. 2.7% H_2, 1.4% H_2S, 0.02% NH_3 and 0.02% HCN. The stream was contacted first with aq. 0.1 wt.% HCHO, to remove fine particles and convert the bulk of the HCN, and then with 0.01N aq. ammonium polysulphide at pH 8, 100°C, where ammonium thiocyanate was formed.(4pp1644RKMHDwgNo0/0).