

[54] RECOVERY OF MERCURY

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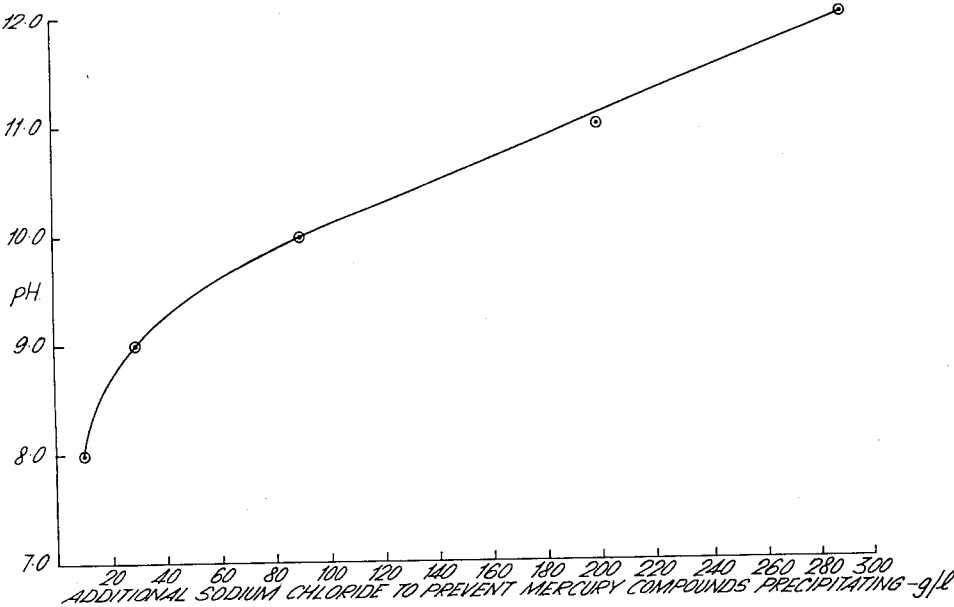
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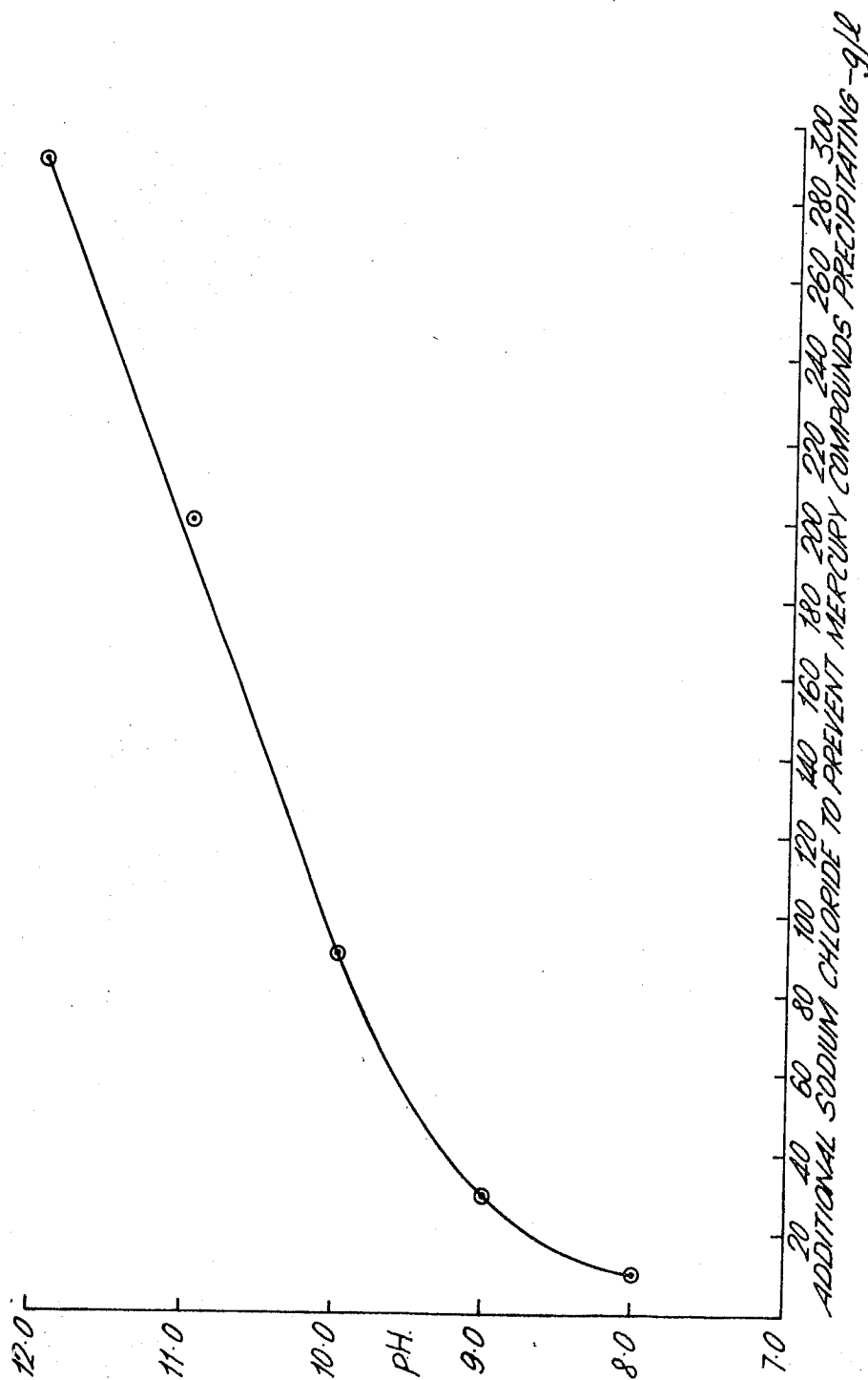
[56] References Cited	
UNITED STATES PATENTS	
1,637,481	8/1927 Glaesch23/87 X
1,984,164	12/1934 Stock.....23/4
2,300,965	11/1942 Randall.....23/4 X
3,115,389	12/1963 Deliaz.....204/99 X
3,194,629	7/1965 Dreibelbis et al.....23/25

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[57] ABSTRACT
Removal of mercury from a gas stream by washing the gas with alkaline hypochlorite containing added alkali metal or calcium chloride.

4 Claims, 1 Drawing Figure





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RECOVERY OF MERCURY

The present invention relates to the discovery of mercury from mercury-laden streams of gases.

The electrolysis of sodium chloride solution, for example, in a cell containing graphite anodes and a mercury cathode is well known. One of the products of the electrolysis of sodium chloride in mercury cathode cells is sodium amalgam, which is conventionally reacted with water in the denuder to produce sodium hydroxide solution and hydrogen. The hydrogen obtained from the denuder is substantially saturated with mercury vapor. Conventionally the hydrogen is cooled so that part of the mercury content is removed directly. It is economically desirable to recover the remaining part of mercury from the hydrogen. During the transfer of the amalgam from the electrolysis cell to the denuder and during the passage of the stripped amalgam back to the electrolysis cell, it is conventionally passed through wash boxes where it is washed with brine and clean water. It is usual for these wash boxes to have loose fitting lids and, in order to prevent mercury vapor escaping to the atmosphere and causing a health hazard, to supply a suction to them by means of a fan. The air thus drawn through wash boxes, known as degassing air, is normally discharged to atmosphere so that a loss of mercury results. It is desirable to recover the mercury from the degassing air.

The present invention is a method of removal of mercury from a stream of gas containing mercury vapor by scrubbing the stream with alkaline hypochlorite solution containing alkali metal chloride or calcium chloride substantially in excess of the chemical equivalent of the alkaline hypochlorite. A particular advantage of this invention is that the scrubbed gas stream is not contaminated with chlorine as would be the case if acid chlorine-containing solutions are used.

The alkaline hypochlorite solution is suitably sodium hypochlorite. Sodium hypochlorite solutions are well known in commerce and normally contain sodium hypochlorite and sodium chloride of approximately equimolar proportions. When mercury vapor is reacted with such solutions, or with solutions prepared by diluting the commercial solutions with water, a precipitate of insoluble mercury compounds is formed. This is inconvenient because it tends to settle out in vessels and pipelines and the like and makes the recovery of the mercury more difficult. It has now been discovered that if additional alkali metal chloride or calcium chloride is added to the alkaline hypochlorite solution, the mercury remains in solution, possibly in the form of a complex anion. The amount of additional sodium or calcium chloride to prevent mercury compounds precipitating depends upon the composition of the solution particularly with respect to pH. For example, the amount of sodium chloride needed to prevent precipitation from a solution containing 5 g./l. mercuric chloride and 5 g./l. available chlorine at various pH's shown in the FIGURE.

The mercury vapor can be absorbed effectively from gas streams by dilute solutions of such hypochlorite containing additional alkali metal chloride. The solution should have an available chlorine content of at least about 0.02 g./l. About 25 g./l. available chlorine is a usually convenient upper limit, although it is possible to use higher available chlorine contents. The pH should be controlled between approximately 8 and 12, and preferably between pH 9 and pH 10.5. The minimum sodium chloride content of a solution containing 5 g./l. of available chlorine in the preferred pH range is 40 g./l. at pH 9 and 140 g./l. at pH 10.5 for operation at ambient temperature.

Washing the mercury-containing gas streams may be carried out in any gas-liquid contacting device, for example, a column packed with Raschig rings or on diffuser plates. It may be carried out at ambient temperature or at any other convenient temperature.

Mercury may be recovered from the solution either chemically or electrolytically. A suitable electrolytic cell for recovering the mercury contains a graphite or platinized titanium anode and a mercury cathode. The mercury in solution is reduced to mercury at the cathode. A preferred method of recovering mercury from the absorbing solution is to blend it slowly into the feed brine stream supplying one or more commercial mercury cells. The mercury in solution is then recovered electrolytically at the cathode.

EXAMPLE 1

The following example illustrates the absorption of mercury vapor from air using a porous ceramic diffuser plate. The diameter of the diffuser plate was 3 inches and the static height of liquor above the plate was 5 inches. The liquor contained 1 g./l. Av. Cl_2 and 100 g./l. NaCl at pH 10.7 and 50° C. The air rate was 430 ft.³/ft.² hr. containing 50 mg./m.³ mercury vapor. The exit concentration of mercury in the air was 0.17 mg./m.³ showing that over 99 percent of the mercury was absorbed.

EXAMPLE 2

The following example illustrates the absorption of mercury from hydrogen using a column packed with Raschig rings. The diameter of the tower was 6 inches and the height of the packing 15 inches. The temperature of the absorbing solution was 15°-20° C. The results of four of the runs are shown on Table 1.

TABLE 1

Run No.	Absorbing solution			Mercury conc., mg./m. ³		Percent mercury absorbed
	pH	g./l. av. Cl_2	g./l. NaCl	Inlet	Out	
1	7.9	8.5	150	6.2	2.8	55
2	9.4	8.5	150	10.4	0.67	94
3	10.1	7.0	150	14.3	0.91	94
4	11.3	7.0	160	11.0	3.4	69

It was found that variation of the available chlorine concentration in the range 0.05-10 g./l. had little effect on the column efficiency.

I claim:

1. A method for removing mercury from a stream of gas containing mercury vapor by scrubbing the stream with alkaline hypochlorite solution containing alkali metal or calcium chloride substantially in excess of the chemical equivalent of the alkaline hypochlorite.

2. A process according to claim 1 wherein the alkaline hypochlorite is sodium hypochlorite.

3. A process according to claim 1 wherein the pH of the alkaline hypochlorite solution is between 8 and 12.

4. A process according to claim 1 wherein mercury vapor is scrubbed with a solution of sodium hypochlorite containing between 0.02 g./l. and 25 g./l. of available chlorine, with a pH in the range 9 to 10.5 and a sodium chloride content of not less than 40 g./l. at pH 9 and not less than 140 g./l. at pH 10.5.

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