

Chemical Resistance of Metallic Materials in Chlorate-chloride Solution

Kinji Harada

Atsumi Kato

Various studies on metallic materials in regard to corrosion resistance in chloride solution have been made, but a similar study on metallic materials in chloride solution in which oxidizers such chlorate has not been made. We, therefore, undertook this phase of study by using aluminium, cast iron, 18-8 stainless steel, nickel, lead, etc.

We tried to determine the corrosion resisting degrees of each of the tested materials by anodic polarization and immersion test in the chlorate-chloride solution. The test results are summarized as follows :

1. Aluminium 18-8 stainless steels, nickel, kanigen showed resisting quality at room temperature.
2. At higher temperature, the oxidation film of cast iron was stable in a conc. chlorate solution, ; unstable in chloride-increased solution, which could be protected by addition of chromic acid.
3. At higher temperature, pitting corrosion was caused on 18-8 stainless steels in acid side, but it was decreased in alkali solution.
4. Nickel had the highest corrosion resisting quality, but a slightly general corrosion at higher temperature.

Study on Corrosion Resistant Materials for Bromine (Ist Rebert)

Corrosion in Anhydrous Liquid Bromine

Kazutaka Sakiyama

Kiyoshi Morinaka

Many difficulties exist in regard to qualities of machinery and equipment employed in the manufacture of the highly corrosive bromine. This report covers a series of tests on containers for shipping of bromine. Tests were conducted using pure Ni, Pb, 18-8 stainless steel, eternal, nylon, polyethylene, vinildene chloride, Kel-F. Our tests revealed that pure Ni, Pb and Kel-F have a fair corrosion resistibility against bromine for a shorter duration of time, while corrosion resistibility was produced in Ni and Pb through mechanical passivity in the test for a longer duration.

Corrosion Resistant Alloys in Hydrochloric Acid
(Ist Report)

Corrosion Resistibility of High Silicon Steel

Kazutaka Sakiyama

Kiyoshi Morinaka

From an immersion test using a test piece of high silicon steel in hydrochloric acid solution, and from the time-natural electrode potential curve and the anodic polarization curve, it is believed that the corrosion resistibility of high silicon steel in hydrochloric acid is attributable to an insoluble adhesive film of grey-whitish color formed as time elapses.

We concluded, therefore, that high silicon steel after it has been given an anodic treatment can with a better advantage be used for an inner valve of antiacid control valve where its use is mechanically permissible, that is where mechanical stress is not great.

Selective Concentration of Sea Water

Hisashi Kisaki

Teruaki Sugioka

Various studies have been made so far on the electrodialytic concentration of sea water by use of multi-ion exchange membrane system. Experimental results have shown that the concentrated liquid had almost the same composition as the original sea water under stationary concentration.

It has been known that the cation exchange resins having sulfonate or carboxyl groups within them possess some selective exchange-properties for ions of higher charge than uni-valent, but excluding hydrogen ion. These resins, therefore, were packed in the desalting chambers with the purpose of separating highly charged ions at the upper compartments of the concentration chambers.

The experimental results showed that the mol ratio of components cations in the residual sea water was greater for univalent ions than the charged one, and that by cascading this effect, separation of ions in sea water is a possibility to some extent. However, complete separation of ions seems to be difficult as the total ionic concentration of sea water is too high for this method.

Manufacture of rBromine from Sea Water Sulphide Method

1. On Absorption of Freed Bromine

Hisaji Katayama

A brief description of the bromine manufacture by sulphide method is made. The absorption tests in this study were made using a horizontal absorber. The inlet of a mixed cases of air, bromine and SO_2 gases was limited by limiting the inlet of air, bromine gas and SO_2 , the tests were conducted by varying concentration of bromine gas, temperature of the mixed gases, and the temperature of the liquid absorbed which are important factors playing in the absorption. The results were compared with the traditional method on the time required for the absorption and the concentration of absorbed liquid in particular. The tests showed that the sulphide method requires less time for absorption of free bromine as hydrogen bromide and produces absorbed liquid of a higher concentration.

Chloromethylation of Benzylchloride

—Report No. 11.—

Isao Ono

Koicni Yabuta

The present study, which follows up the study of Report I concerning the chloromethylation of benzylchloride by zinc chloride as a sole catalyst, is on the chloromethylation of benzylchloride by zinc chloride with arsenic (III) oxide, zinc chloride with phosphoric acid, arsenic (III) oxide, and phosphoric acid.

The tests showed that addition of arsenic (III) oxide or phosphoric acid to zinc chloride decreases the formation of substances of higher boiling point such as bis (p-chloromethyl phenyl) methane, while producing no change in the proportion of isomers of xylylenedichloride. The results were quite similar to that of the tests in which p-xylylenedichloride zinc chloride as the sole catalyst was used. The maximum yield of was 50-55%.

Studies on the Pyrolysis of Hydrocarbons and the Utilization of Produced Gases

Isao Ono

Tadashi Ishida

The purpose of these studies was to find ways to utilize light olefines obtained by pyrolysis of hydrocarbons as they are and without separating them into their components.

Tests were conducted to produce ethylene oxide and propylene oxide from light olefines obtained by pyrolysis of propane gas by reacting hypochloric acid on the gases and then treating the reacted solution with aqueous alkali-solution.

The yield of ethylene by the pyrolysis of propane gas was 50-55 volume-percent, while the concentration was 25-28 percent. The yield of chlorohydrines is expected to exceed 80 percent in the future. The yield of ethylene oxide and propylene oxide was rather poor, showing only about 70 percent.

Test of the Cement Cooler

Riichiro Imoto

Haruo Ninao

In these tests, Smith's Cement Cooler was used and a heat balance was calculated. The tests were conducted on inlet velocity at 29t/h. at temperature 78 degrees C. with circulating cooling water at 10t/h at water temperature at 18 degrees C. The cooler's cooling effect was tested by changing the velocity of cooler's rotation between the ranges of 230-313 per minute and comparing the results obtained from when inlet velocity was increased to 39t/h at temperature of 116 degrees C. with cooling water circulation at 10t/h at water temperature of 18 degrees C. The cooling effect in these tests showed highly favourable.

A Study on Operation Analysis of Cement Industry

Shigeru Watanabe

Hideo Tomoyasu

Making operation analysis for the cement industry involves some difficulties. In this study our standard working regulations in the cement industry and correlated data in the past were taken as basis of our analysis, and the results of analysis are shown.

Spectrophotometric Determination of Traces of Metals

(111) Determination of Chromium in Brine

Hiroshi Imoto

Heavy metal impurities in the electrolyte (concentrated NaCl solution) have a marked influence on the chlorine-caustic electrolysis by the mercury cell process. Therefore it becomes necessary to determine the amount of heavy metal contained.

In the present study, a rapid colorimetric method for the determination of small amount of chromium in the electrolyte is described.

Chromium in the electrolyte is concentrated in ferric hydroxide, precipitated as carrier. Ferric hydroxide is filtered and separated from a large amount of sodium chloride. Then ferric hydroxide containing chromium (III) is dissolved with diluted HCl and concentrated HNO_3 , and evaporated to dryness. Next, chromium is oxidized to hexivalent state by bromine in alkaline solution, and precipitated ferric hydroxide is filtered and removed. The filtrate, then, is acidified with H_2SO_4 , and the excess bromine is removed with phenol which reacts to form tribromophenol. Diphenylcarbazide is used as the color reagent. A clear red-violet color is obtained which can be measured spectrophotometrically at the wave length of $545 \text{ m}\mu$.

Spectrophotometric Determination of Traces of Metals

(11) Determination of Nickel in Caustic Soda

Morito Toshimitsu

After Ni^{2+} has been oxidized by addition of bromine water, dimethylglyoxime solution is added in the presence of ammonia. Soluble complex salt of Ni (IV) with orange-red coloration is produced. This is extremely sensitive.

This report describes that the method of determination of trace amount of nickel through separating and concentrating the trace metal by using dimethylglyoxime solution and extraction mixture (2 parts by volume carbon tetrachloride, 1 part by volume of chloroform) from sample, and the coloration phenomenon. The extracted solution of Ni is determined by estimating absorbancy at $450 \text{ m}\mu$.