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CONTAINER FOR THE STORAGE OF SOLUTIONS OF PEROXYGEN COMPOUNDS

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1 Claim. (Cl. 206—84)

This invention relates to the storing and handling of solutions of peroxygen compounds. More particularly, it relates to the use of containers formed of magnesium and its alloys for the storage and shipment of alkaline solutions of hydrogen peroxide.

Although containers formed of various metals including aluminum and its alloys have been used to a considerable extent for storing and shipping acidic solutions of hydrogen peroxide, there has been no generally satisfactory structural material for the storage of alkaline solutions of hydrogen peroxide. While solutions of hydrogen peroxide which are alkaline in reaction are widely used for oxidizing and bleaching purposes, no satisfactory metallic structural material for forming containers designed to hold such solutions has been available. This problem is also frequently encountered where alkaline solutions of other peroxygen compounds, such as sodium peroxide or sodium perborate, are stored, or handled.

We have now discovered that magnesium, either as the pure metal or in the form of its alloys, is particularly satisfactory for constructing storage vessels, conduits, measuring vessels, and other containers the surfaces of which come into contact with alkaline solutions of peroxygen compounds. For storing alkaline solutions of hydrogen peroxide, or alkaline solutions of other peroxygen compounds such as the alkali metal peroxides or alkali metal perborates, we have found that storage vessels formed of magnesium or alloys of magnesium of high magnesium content are particularly satisfactory.

While magnesium has been suggested as suitable for a structural material for the construction of containers designed to hold aqueous solutions of alkalies, it has been generally thought to be subject to attack under the conjoint action of strong alkalies and oxidizing agents. Surprisingly enough, we have found that even when magnesium and its alloys are subjected to the action of oxidizing agents such as hydrogen peroxide in strongly alkaline solution, the metallic surfaces are not attacked to any appreciable extent by the combined action of alkaline agents and active oxygen yielding compounds.

We have discovered that magnesium and its alloys when used to form the surfaces of structural vessels which come into contact with alkaline solutions of peroxygen compounds does not exert any detrimental effect upon the stability of the alkaline solution, but actually improves the stability of such solutions. The common structural metals, such as iron, steel, copper, brass, etc., are not only corroded and destroyed by alkaline solutions of peroxides such as hydrogen peroxide, but they also have the objectionable disadvantage that they are decomposition catalysts for the solutions of peroxygen compounds. Moreover, as magnesium and its alloys are metals of relatively low density, it is possible to form the containers for alkaline solutions of hydrogen peroxide or other percompounds of relatively light weight material. This factor is of particular advantage in constructing shipping containers or tank cars which must be handled and shipped as freight.

Accordingly, it is one of the objects of this invention to provide storage vessels which are extremely satisfactory for storing and handling alkaline solutions of peroxygen compounds such as solutions of hydrogen peroxide which are alkaline in reaction, alkaline solutions of the various alkali metal peroxides, and solutions of the various alkali metal perborates. Another object of this invention is to provide a metallic structural material for constructing the parts and surfaces which come into contact with alkaline solutions of peroxygen compounds, which structural material is neither corroded nor destroyed by the alkaline solutions of active oxygen-yielding compounds. In addition to this distinct advantage, magnesium and its alloys, moreover, possess the further advantage of not exerting any detrimental effect upon the stability of the solution of the peroxygen compound. A further advantage of this metal as a structural material for solutions of this character results from its relatively low density which permits the construction of containers, storage tanks, storage vessels, measuring vessels, conduits, etc., for alkaline solutions of peroxygen compounds which are relatively light in weight, and which may be readily moved when stored in a commercial bleachery and readily shipped at low cost in commercial vehicles.

We have found that magnesium and its alloys, especially those alloys of high magnesium content, do not corrode even when in contact with alkaline solutions of peroxygen compounds such as hydrogen peroxide, sodium peroxide, sodium perborate, or other peroxygen compounds during relatively long periods of storage. Moreover, these metals do not possess any deleterious action upon the stability of the alkaline solution of the peroxygen compound. Even when the alkaline solution of the peroxygen compound is stored at a temperature materially above room temperature, no corrosion of the magnesium or mag-

nesium alloy surfaces occurs, nor is the stability of the alkaline solution of the peroxygen compound adversely affected.

These properties of magnesium and its alloys, especially alloys of high magnesium content, can best be illustrated by the tests described in the following examples. It may be stated that the ability of magnesium and its alloys to resist corrosion when in contact with alkaline solutions of peroxygen compounds, and its lack of detrimental effect on the stability of the peroxygen compound, can readily be shown by tests involving merely immersing a sheet of magnesium or magnesium alloy in an alkaline test solution of a peroxygen compound.

Example 1

A solution of hydrogen peroxide of 1 volume concentration was prepared by dissolving 20 cc. of commercial 100 volume hydrogen peroxide solution sold under the trade-mark name "Albone" in 2 liters of water. It may be stated that the "volume concentration" of a solution of a peroxygen compound is the number of volumes of oxygen gas, measured at 0° C. and 760 mm. mercury pressure, that will be released from 1 cc. of the solution maintained at 20° C.

To the hydrogen peroxide solution of 1 volume concentration, there was added 14.4 g. of 42° Bé. sodium silicate for the purpose of rendering the solution alkaline in reaction. The resulting alkaline solution was then divided into two equal parts and in one part there was placed a weighed sheet of magnesium. Both solutions were then heated to 180° F. and maintained at that temperature for the duration of the test.

At the end of 5 hours, both solutions were analyzed to determine active oxygen content. The solution not containing magnesium test strip was found to have lost 20% of its active oxygen content, while the alkaline solution containing the test strip had lost only 10% of its active oxygen content. The test was then continued until a period of three days had elapsed, at the end of which period the magnesium test strip was removed and weighed. There was no loss in weight of the magnesium test strip, nor was there at any time any evidence of corrosion or pitting of the test strip.

Example 2

A solution of hydrogen peroxide of 1 volume concentration was prepared by dissolving 10 cc. of commercial 100 volume hydrogen peroxide solutions (sold under the trade-mark name "Albone"), in one liter of water. The solution was then rendered alkaline by the addition of 7.2 g. of tetrosodium pyrophosphate. A weighed sheet of magnesium was then immersed in the alkaline solution of hydrogen peroxide and the temperature raised to 180° F. This temperature was maintained for three days, at the end of which period the magnesium test strip was removed and weighed. The weight determination showed but a negligible loss in weight, and at no time was there any evidence of corrosion, either pitting corrosion or uniform corrosion, on the surface of the test strip.

At the end of the three-day test period, the stability of the alkaline solution of hydrogen peroxide was determined. It was found that only a very small loss in active oxygen had occurred, even though the conditions of the test were relatively severe because of the high temperature maintained for the prolonged period of test.

Since various changes may be made in the details given herein as illustrative of preferred embodiments of our invention without departing from the scope of the invention, its scope should be determined in accordance with the appended claim, considered in connection with the relevant prior art.

We claim:

A package of a peroxygen compound comprising an alkaline solution of a peroxygen compound contained in a metallic container, the surfaces of which container coming in contact with the solution of the peroxygen compound are formed of a metallic material selected from the group which consists of magnesium and magnesium alloys of high magnesium content.

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