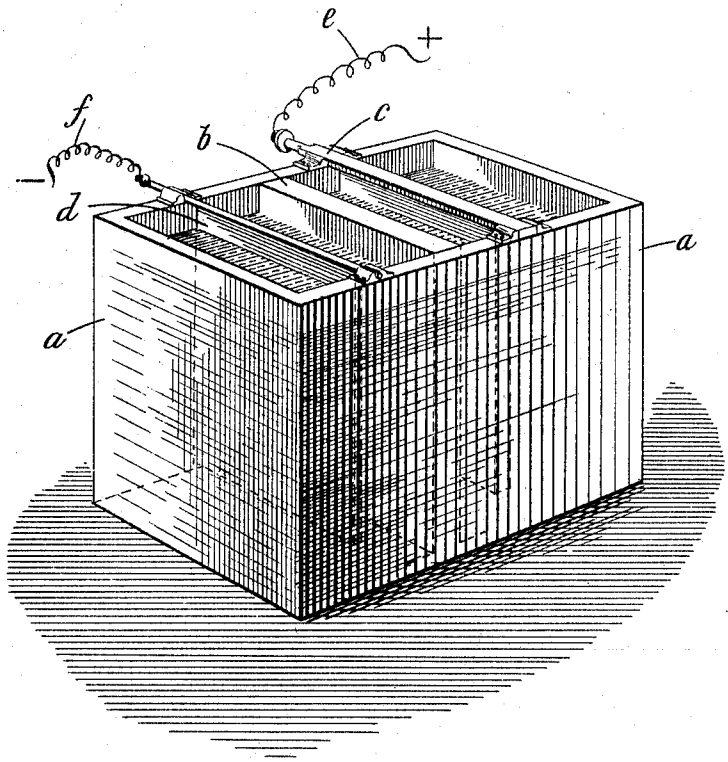
No. 759,887. PATENTED MAY 17, 1904.

F. HINZ.

PROCESS OF MANUFACTURING PEROXIDS.

APPLICATION FILED NOV. 23, 1903.

NO MODEL.



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No. 759,887. Patented May 17, 1904.

UNITED STATES PATENT OFFICE.

FRIEDRICH HINZ, OF BERLIN, GERMANY.

PROCESS OF MANUFACTURING PEROXIDS.

SPECIFICATION forming part of Letters Patent No. 759,887, dated May 17, 1904.

Application filed November 23, 1903. Serial No. 182,380. (No specimens.)

To all whom it may concern:

Be it known that I, FRIEDRICH HINZ, physician, a subject of the German Emperor, residing at Berlin, Germany, (whose post-office address is 105[c] Friedrichstrasse, Berlin, Germany,) have invented a Process for the Electrolytic Manufacture of Peroxids of Magnesium and Zinc, (for which I have applied for a patent in Germany on the 27th of November, 1902,) of which the following is a specification.

The present invention relates to a process for the electrolytic production of magnesium peroxid and zinc peroxid.

The electrolyte in contact with the anode is a solution of magnesium chlorid or zinc chlorid and that in contact with the cathode is a solution of the same salt, to which has been added a suitable quantity of hydrogen peroxid. An insoluble anode, such as platinum or carbon, is employed, and the cathode used in my process is made of an alkali-proof and inoxidizable material, such as platinum or tin. The cathode-compartment is separated from the anode-compartment by a porous diaphragm.

The accompanying drawing illustrates an example of an apparatus suitable for carrying out my process.

a indicates the pot or cell containing the electroyte.

b indicates the porous diaphragm.

c is a carbon plate serving as anode, *d* a platinum plate serving as cathode.

e and *f* are the wires connecting the electrodes with a source of electric current.

Any free acid that may be present in the solution for the cathode-compartment is neutralized by adding the required quantity of the oxid or hydrate of the corresponding metal before the commencement of the electrolyzing process.

It is known that a product containing magnesium peroxid may be obtained from solutions of magnesium salts by causing hydrogen peroxid to act on the latter, provided that an alkali has been previously added to the said solution, the quantity of the alkali thus added corresponding approximately to the quantity of hydrogen peroxid or of the magnesium salt to be employed. Although in this purely-chemical process the said addition of alkali is absolutely necessary for obtaining the desired precipitate, the addition has a very unfavorable effect on the product obtained, inasmuch as it will at the same time precipitate large quantities of magnesium hydroxid, so that the resulting product contains only a low percentage of MgO_2, (about five to ten per cent.) This drawback in comparison with the electrolytic process exists also, although in a diminished degree, in the process for the production of magnesium peroxid by the action of sodium peroxid on solutions of magnesium salts. In my electrolytic process there is no alkali present, which might cause the precipitation of magnesium hydrate, and the quantity of MgO_2 contained in the product resulting from the present process is therefore considerably higher than in the products obtained by the known methods. The magnesium is separated out on the cathode exclusively by the action of the electric current and can immediately (while in a nascent state) interact with the hydrogen peroxid, probably in the manner represented by the following equation:

$$Mg+H_2O_2+2H_2O=Mg\begin{matrix}(OH)_2\\(OH)_2\end{matrix}+2H$$

According to this equation the resulting product should contain more than sixty per cent. of MgO_2. As a rule, however, only about forty per cent. of MgO_2 is obtained, and the apparent contradiction is explained by the fact that a portion of the magnesium peroxid thus formed will be decomposed already while in the electrolyte and another portion during the drying process, so as to yield up its active oxygen. Consequently special care should be bestowed on the drying process, in which case a product containing more than fifty per cent. and even almost sixty per cent. of MgO_2 is sometimes obtained. After the product

has been dried it may be preserved in good condition for an indefinite time by storing it in sealed bottles.

The product obtained by electrolysis in the manner described is superior to the preparations hitherto employed, owing to its greater purity and its higher percentage of MgO_2 and consequently of active oxygen, and is therefore preferable, especially for medicinal use.

The details of procedure in the case of magnesium peroxid may be as follows: An aqueous solution of magnesium chlorid containing about two hundred grams of crystalline magnesium chlorid per liter is placed in the anode-compartment of an electrolyzer having a porous diaphragm separating the anode from the cathode compartment. The cathode-compartment is charged with a solution of hydrogen peroxid containing about the same quantity of magnesium chlorid in solution after any free acid contained in the said solution has been neutralized with the necessary quantity of magnesium oxid or magnesium hydroxid. The cathode consists of platinum and the anode of carbon. An electric current with a pressure of about six to seven volts at the terminals is then caused to pass through the two solutions. If the current is sufficiently strong, magnesium peroxid in the shape of a white powder will immediately commence to form a deposit on the cathode in considerable quantity. This deposit separates spontaneously from the cathode, drops back into the electrolyte, and collects in the cathode-compartment, from which it is then removed, washed, and dried at a moderate heat. The electrolytic production of zinc peroxid takes place in the same manner. The zinc peroxid is also a white amorphous powder and is apparently formed according to the equation:

$$Zn+H_2O_2+2H_2O=Zn\begin{matrix}(OH)_2\\(OH)_2\end{matrix}+2H$$

According to this the product should contain seventy-three per cent. of ZnO_2; but as a rule only fifty-five to sixty per cent. is obtained, for reasons similar to those explained in the case of magnesium peroxid. The details of procedure are also analogous to those described above, as shown by the following example: Two hundred grams of zinc chlorid are dissolved in one liter of water and the same quantity in hydrogen-peroxid solution, which solutions are then poured, respectively, into the anode-compartment and into the cathode-compartment. If the cathode liquid has remained turbid, a few drops of hydrochloric acid are added to render it clear, and the solution is then neutralized by means of oxid or hydrate of zinc. The electrolysis takes place at a pressure of 2.5 to three volts, for, unlike the manufacture of magnesium peroxid, where stronger currents may be used with advantage, only weak currents should be employed for the manufacture of zinc peroxid, because otherwise metallic zinc would be separated out and affect the quality of the product. In accordance with the weaker current employed the deposit on the cathode takes place much more slowly than in the case of magnesium peroxid.

What I claim is—

1. The process for the electrolytic production of the peroxids of magnesium and of zinc in an electrolyzer having a porous diaphragm separating the anode-compartment from the cathode-compartment, which consists in charging the anode-compartment with an aqueous solution of the corresponding metallic chlorid and the cathode-compartment with a neutral aqueous solution of the same chlorid and of hydrogen peroxid, and passing an electrolyzing-current through the said solutions, substantially as described.

2. The process for the electrolytic manufacture of the peroxids of magnesium and of zinc by means of an electrolyzer having a cathode-compartment and an anode-compartment separated from each other by a porous diaphragm, which consists in charging the anode-compartment with an aqueous solution of the corresponding metallic chlorid and the cathode-compartment with a neutral aqueous solution of the same chlorid and of hydrogen peroxid, passing an electrolyzing-current through the said solutions, collecting the peroxid powder which has been deposited on the cathode and then dropped back into the electrolyte, and drying the same, substantially as described.

3. The process for the electrolytic production of magnesium peroxid in an electrolyzer having a cathode-compartment and an anode-compartment separated from each other by a porous diaphragm, which consists in charging the anode-compartment with an aqueous solution of magnesium chlorid and the cathode-compartment with a neutral aqueous solution of magnesium chlorid and of hydrogen peroxid, and causing an electrolyzing-current to pass through the said solutions, substantially as described.

4. The process for the electrolytic production of magnesium peroxid by means of an electrolyzer having a cathode-compartment and an anode-compartment separated from each other by a porous diaphragm, which consists in charging the anode-compartment with an aqueous solution of magnesium chlorid and the cathode-compartment with a neutral aqueous solution of magnesium chlorid and of hydrogen peroxid, causing an electrolyzing-current to pass through the said solutions, so as

to produce on the cathode a deposit of magnesium-peroxid powder which then drops back into the solution and collects in the cathode-compartment, removing the peroxid powder thus accumulated and drying it, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FRIEDRICH HINZ.

Witnesses:
STANISLAUS HOLTZER,
JULIUS HINZ.