UNITED STATES PATENT OFFICE.

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PROCESS OF MANUFACTURING MATERIAL FOR ALKALINE BATTERIES.

976,278. Specification of Letters Patent. Patented Nov. 22, 1910.

No Drawing. Application filed September 26, 1910. Serial No. 583,896.

To all whom it may concern:

Be it known that I, WILLIAM MORRISON, a citizen of the United States of America, and resident of Des Moines, Polk county, Iowa, have invented a certain new and useful Improvement in Processes of Manufacturing Material for an Alkaline Battery, of which the following is a specification.

My invention relates to improvements in reversible galvanic batteries, in which zinc is one of the elements, and more particularly to a battery in which the positive electrode is composed of a compound of zinc and chromium.

It has for its object the improved method for making this compound for the positive electrode.

A further object is the improved method by which an electrode of this composition is constructed at moderate cost and has a long period of efficiency.

These and such other objects as may hereinafter appear are attained by my invention.

My improved electrode is obtained in the following manner: I first take a sufficient quantity of chromium sulfate, such as can be purchased on the market; the green colored compound I have found to be better for my purpose than any of the other chromium sulfate compounds upon the market. I then thoroughly dissolve this compound in hot distilled water. Next I take a sufficient quantity of zinc oxid and mix the same thoroughly in water, preferably by means of an agitator, until the solution is entirely free from lumps and a thin paste is obtained. I then add to this solution, while it is in an agitated condition, the chromium sulfate solution obtained above. The proportions of the chromium compound and the zinc oxid can be varied to quite a large degree, but I find that good results are obtained by using three pounds of zinc oxid to one pound of the chromium sulfate. The chromium sulfate solution, when first added to the zinc oxid, is a deep green. The action of the zinc oxid upon this, however, produces a clear solution and a light green precipitate of zinc oxid and chromium sulfate. The exact composition of this precipitate is not fully known, but it is thought that the chromium unites with both the zinc oxid and the sulfuric acid, as it is found that the solution contains no zinc sulfate. However, the exact chemical reactions which take place are not thought to be essential, as my invention consists in the particular method which I employ in obtaining my final compound. I then pour off the solution from this precipitate of zinc oxid and chromium sulfate, and add a strong solution of hot caustic potash. This caustic potash acts to form a solution of potassium sulfate and a precipitate of a zinc chromium compound. If suitable proportions are used in the first place, this compound may be zinc chromite; but when different proportions are used, other compounds of zinc and chromium will be obtained. I, therefore, do not wish to limit myself to the compound of zinc chromite. I then pour off the potassium sulfate solution from this zinc chromium precipitate, and then wash this precipitate several times with hot water in order to remove all traces of the sulfate. The zinc chromite or other zinc chromium compound which is obtained is then dried in any suitable manner, such as with a centrifugal drier, and the material is then ready to be packed into the grid.

While I have described my improved method of producing this zinc chromium compound, I do not desire to be restricted to the specific method described, as various modifications will readily suggest themselves. For example, other equivalent solutions may be used in place of the caustic potash which I have described. I do not wish to limit myself to the exact method described, as it is obvious that various modifications will readily suggest themselves to anyone skilled in the art.

The electrode thus obtained is preferably used with an alkaline electrolyte, such as potassium hydroxid, and any suitable negative electrode may be obtained; for example, such a one as described in my co-pending application Serial Number 531,230, in which an electrode composed of the oxids of silver and mercury is described. It is to be understood, however, that I do not desire to limit myself to the use of any particular electrolyte or negative electrode, as a large number of such electrolytes and negative electrodes are adapted for use with my improved positive electrode, consisting of a zinc chromium compound. I may also produce my compound of zinc and chromium by the following method: To a suitable quantity of chromium sulfate or other chrome salts add a hot strong solution of potassium hydroxid. An excess of the hydroxid should be used so that the chromium which is first precipi-

tated will be redissolved. This solution is then added to the agitated zinc oxid whereby a precipitate of a zinc chromium compound is obtained and a solution of potassium sulfate. This precipitate is then washed as before to remove all traces of the sulfate and then dried. Before packing the material in the grid a suitable quantity of mercury oxid should be added.

What I claim as my invention is:

1. The method of producing a compound for use in reversible galvanic batteries, which consists in first taking a mixture of zinc oxid and water and in agitating the same, then adding a suitable amount of chromium sulfate to this mixture while it is being agitated, whereby a compound zinc oxid and chromium sulfate is obtained, then acting upon this with a strong alkaline solution to remove the sulfate, thus leaving a compound of zinc chromium oxid, and in then washing this compound to remove traces of the sulfate.

2. The method of producing a compound for use in reversible galvanic batteries, which consists in adding a solution of chromium sulfate to a zinc oxid, whereby a compound of zinc oxid and chromium sulfate is obtained, then acting upon this with a strong alkaline solution to remove the sulfate, thus leaving a compound of zinc and chromium oxid, and then washing this compound to remove traces of the sulfate.

3. The method of producing electrodes for reversible galvanic batteries, which consists in adding to a quantity of zinc oxid a chromium sulfate solution whereby a precipitate containing a compound of zinc oxid and chromium sulfate is obtained, then adding to this precipitate an alkaline solution, in then washing the precipitate thus obtained to remove traces of the sulfate, and in then drying the same and packing it in a suitable grid.

4. The method of producing electrodes for reversible galvanic batteries, which consists in adding to a quantity of zinc oxid a chromium sulfate solution whereby a precipitate containing a compound of zinc oxid and chromium sulfate is obtained, then adding to this precipitate an alkaline solution, and in then drying the precipitate thus obtained and then packing the same in a suitable grid.

5. The method of producing a compound for use in reversible galvanic batteries, which consists of combining zinc oxid and chromium sulfate, in then adding to the precipitate thus obtained a solution of potassium hydroxid, and then washing this compound to remove traces of the sulfate.

6. The method of producing a compound for use in reversible galvanic batteries, which consists of combining zinc oxid and chromium sulfate, and in then adding to the precipitate thus obtained a solution of potassium hydroxid.

7. The method of producing a compound for use in reversible galvanic batteries, which consists in combining suitable quantities of zinc oxid, chromium sulfate, and an alkaline solution from which is precipitated a compound containing zinc and chromium.

Signed by me at Chicago, Illinois, this 22d day of Sept. 1910.

WILLIAM MORRISON.

Witnesses:

ELLEN H. CLEGG,

WM. B. DURNION.