

UNITED STATES PATENT OFFICE.

CARL LUCKOW, OF COLOGNE-DEUTZ, GERMANY.

PROCESS OF PRODUCING BASIC PHOSPHATE OF COPPER BY MEANS OF ELECTROLYSIS.

SPECIFICATION forming part of Letters Patent No. 627,267, dated June 20, 1899.

Application filed December 31, 1897. Serial No. 665,215. (No specimens.)

To all whom it may concern:

Be it known that I, CARL LUCKOW, a subject of the King of Prussia, German Emperor, residing at Cologne-Deutz, Germany, have invented certain new and useful Improvements in Processes of Producing Basic Phosphate of Copper by Means of Electrolysis, of which the following is a specification.

The invention has been patented in England, No. 14,801, dated August 6, 1895.

The object of this invention is to produce basic phosphate of copper by means of electrolysis.

It consists, essentially, in the use as an electrolyte of a salt of chloric acid with sodium, potassium, or ammonium in mixture with a salt of phosphoric acid with sodium, potassium or ammonium in aqueous solution in connection with electrodes of copper. The mixture should be about eighty per cent. of one of the salts named above of chloric acid and about twenty per cent. of one of the salts named above of phosphoric acid, and the aqueous solution should contain from 0.3 to three per cent. of the mixture, the quantities of salt always calculated free from water. This solution serves as electrolyte, and the electrodes are of lead. Under the influence of the electric current the copper of the anode is dissolved by the chloric acid of the one salt forming chlorate of copper, which dissolves and is directly precipitated by the phosphoric acid of the other salt as basic phosphate of copper. At the same time water is decomposed, the oxygen of which enters into the basic phosphate of copper, while the hydrogen escapes. The following chemical formulæ will explain the process somewhat further:

40 $2\text{ClO}_3\text{Na} + \text{PO}_4\text{Na}_2\text{H} + 4\text{H}_2\text{O}$
Chlorate of sodium + sodium phosphate in aqueous solution react under the influence
45 of the electric current as if chloric acid +
 $2\text{NaOH} + \text{PO}_4\text{H}_3$
sodium hydroxid + phosphoric acid + sodium hydroxid were present. The chloric acid
50 $\text{Cu} =$
dissolves the copper anode, forming soluble
 $(\text{ClO}_3)_2\text{Cu} + \text{H}_2$
chlorate of copper, while hydrogen escapes.
55 The chlorate of copper is precipitated by the

$\text{PO}_4\text{H}_3 = \text{PO}_4\text{HCu} + \text{ClO}_3\text{H}$
phosphoric acid as copper phosphate, and chloric acid is regenerated. The reactions go, therefore, on according to the chemical equations

I. $2\text{ClO}_3\text{Na} + 2\text{H}_2\text{O} + \text{Cu} = (\text{ClO}_3)_2\text{Cu} + \text{H}_2 + 2\text{NaOH}$

II. $\text{PO}_4\text{Na}_2\text{H} + (\text{ClO}_3)_2\text{Cu} = \text{PO}_4\text{CuH} + 2\text{ClO}_3\text{Na}$

The phosphoric acid thus consumed must be continuously added afresh to the electrolyte. By the use of such two salts in about such proportions and such weak aqueous solutions the basic phosphate of copper formed does not adhere to the anodes, which keep bright. The process goes on continuously with the same electrolyte, as the chloric acid is not decomposed by the electric current and as the phosphoric acid and water consumed in the process are always added as they are consumed.

Example: A diluted solution one and one-half-per cent. strong of a mixture of eighty parts, by weight, of chlorate of sodium with twenty parts, by weight, of phosphate of sodium forms the electrolyte. The electrodes consist of copper. The electrolyte is faintly alkaline. The tension of the current is two volts. The intensity of the same is fifty amperes. The density of the same is 0.5 amperes per square decimeter of anode-surface. The electrolyte has to be kept faintly alkaline during the electrolysis and water and phosphoric acid have continuously to be added and also air in order to facilitate the reaction.

What I claim is—

The herein-described process of producing basic phosphate of copper by means of electrolysis by using with anodes of copper an aqueous solution as electrolyte containing from 0.3 to three per cent. of the sodium, potassium or ammonium salts of chloric acid in mixture with the sodium, potassium or ammonium salts of phosphoric acid, passing the current and maintaining the bath constant by the continuous addition of water and phosphoric acid and air, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CARL LUCKOW.

Witnesses:

WILLIAM H. MADDEN,
OTTO STRECKER.