Cl. 204

Published June 15, 1943

Serial No. 144,078

ALIEN PROPERTY CUSTODIAN

PROCESS OF SEPARATION BY ELECTROLYSIS OF THE ORGANIC ACIDS AND SALTS FROM ALBUMINOIDS AND THEIR ACCOMPANYING PECTIC SUBSTANCES

Umberto Busico, Lecce, Italy; vested in the Alien Property Custodian

No Drawing. Application filed May 21, 1937

The present invention regards electrolytic separation and purification of organic acids and salts from colloidal substances, for instance separation of tartaric acids and its salts from tartaric products, citric acid from lemon juice, acetic acid from pyroligneous acid, purification of tartar from the "sablons rouges," and so forth.

It is known that in electrolysing the watery solutions of the organic acids or, more precisely, their alkaline salts, hydrogen develops at the cathode, whilst at the anode the anion is decomposed causing formation of CO_2 and a saturated or non-saturated hydrocarbon. For instance Kolbe subjecting, in the year 1848–49, to electrolysis a slightly concentrated watery solution of acetate of potassium obtained ethane:

$$\begin{matrix} H_3C.COOK \\ H_3C.COOK \end{matrix} \longrightarrow \underbrace{\begin{matrix} CH_3 \\ | \\ CH_3 \end{matrix}}_{\text{Anode}} + 2CO_2 + \underbrace{2K}_{\text{Cathode}}$$

Of course, potassium reacts with water and CO_2, forming carbonate of potassium.

By electrolysis of the dibasic acids of the succinic acid series, olefines are obtained. Thus, for instance, from the electrolysis of succinic acid ethylene is obtained:

$$C_2H_4(COOH)_2 \longrightarrow C_2H_4 + 2CO_2 + H_2$$

By electrolysis of the salts and acids of the fumaric acid series hydrocarbons of the C_nH_{2n-2} series are obtained.

Applicant has found that when the electrolysis of the alkaline salts is effected with small voltage and small current density, for instance 0,5–1 amp. for 1 dm^2 of active electrode, and eventually with porous diaphragms, for instance porcelain diaphragms interposed between anode and cathode,— the above said decompositions do not take place, but a regular separation of the anions and cathions at the electrodes are obtained, with production of high currents which may reach a value comprised between 60% and 70% and nearly integral utilization of raw materials for the obtention of useful products.

For obtaining low voltage it is necessary that the anodic liquid should be conductive, and may consist, for instance in the case of tartaric products, of solutions of sodic or, better still, potassic salts. By electrolysis neuter potassium tartrate is formed at the cathode, which is very soluble in water and has the feature of dissolving even the very calcium tartrate for the formation of mixed soluble salt, whilst at the anode tartar is precipitated, and tartrates of other metals are formed. If the cathodic and anodic liquids are filtered and again subjected to electrolysis, but put in contact with the heteronymic electrodes (and the cathodic one with other raw material) the same reaction will take place again. Thus one succeeds at low temperature between 30°C and 50°C with large hourly out-put, small water volume, small labour and good electrolytic output with complete exhaustion of raw material of its useful substances, and small cost of plant,— in obtaining products which with ordinary processes require a heavy outlay, much labor, non-continuous process and large quantity of water and fuel with less hourly output.

The reaction with tartaric process is probably:

$2KHA \rightarrow K_2A + H_2A$ (which migrates to the anode), in which

(A=acid residue=$C_4H_4O_6$)

at the anode:

$$K_2CO_3 + H_2A \rightarrow K_2A + H_2O + CO_2$$

and in a second time:

$$K_2A + H_2A \rightarrow 2KHA$$

And in a perfectly analogous way at the anode citrate of sodium potassium, magnesium, ecc. may be obtained.

This theoretical explanation of the experimental fact has no other than illustrative, but no limitative value.

The process also permits of obtaining mixed salts. Thus by electrolysing in the above described conditions with iron anode ferro-potassic tartrate in fine crystals is obtained.

With this process are obtained:

(1) Separation of organic acids at the anode by electric current,

(2) Separation of said acids from colloids,

(3) Production of useful substances, acids or their salts, and particularly

(4) Extraction of tartaric acid and citric acid and their salts from the raw materials, and

(5) Refining of products.

This invention has been described in one of its particular forms of realization, but it is understood that structural modifications are possible within the scope of invention.

UMBERTO BUSICO.