

UNITED STATES PATENT OFFICE

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ELECTROLYTIC PRODUCTION OF SODIUM PERCHLORATE

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The present invention relates to improvements in the electrolytic production of sodium perchlorate.

According to the known processes for the electrolytic production of sodium perchlorate it is necessary to practically exhaust the amount of sodium chlorate present in the electrolyte so as to be able to obtain a sufficiently pure perchlorate and particularly a product yielding as little potassium chlorate as possible when the solution of perchlorate is subsequently converted into potassium perchlorate by means of potassium chloride. When complying with this requirement, however, the wear the platinum anodes becomes excessive and in the final stages of the process, an enhanced formation of ozone takes place simultaneously. Moreover, the current and energy yield show a decided reduction in the course of the process.

I have now found that these disadvantages are practically avoided when carrying out the process in such a manner that the perchlorate concentration of the bath is maintained, during the greater part of the process, at a higher level than hitherto usual.

According to the present invention, this is effected by continually replenishing the sodium chlorate contents of the bath, and preferably by maintaining a chlorate concentration, of say, not less than about 150 grs. per litre as long as the perchlorate content of the bath does not exceed about 1000 grs. per litre. This manner of procedure is only possible by carrying out electrolysis at moderately elevated temperatures, say 40–50° C., so as to increase the solubility of the chlorate in the electrolyte. Towards the termination of the electrolysis, the concentration may be raised up to 1200 grs. per litre of sodium perchlorate. As the lye then contains comparatively small amounts of chlorate (below about 1.5 percent of the perchlorate contents), the addition of potassium chloride immediately yields a potassium perchlorate of entirely sufficient purity for technical purposes.

Example

The electrolyte containing the usual quantity of bichromate of sodium (about 3–4 grs.

per litre) and having a starting concentration of about 800 grs. NaClO_3 per litre is subjected to electrolysis between platinum anodes and iron cathodes with a current density—equal at both electrodes—of 0.36 ampere per square centimetre at a temperature of about 43–45° C. The electrolyte is continually replenished with NaClO_3 , 250 grs. of this salt being required so as to maintain a minimum NaClO_3 concentration of not less than 150 grs. per litre when about 1000 grs. NaClO_4 per litre are contained in the solution. From this point the addition of NaClO_3 is discontinued so as to allow of entire consumption of the remaining chloride. When the concentration of NaClO_3 amounts to about 15 grs. per litre, i. e. about 1.3 percent of the perchlorate present in the bath, the current is shut off and the electrolyte worked up into perchlorate of potassium in the manner known per se. The average current yield amounts to 95 percent, the energy yield being about 3.0 kwh. per kg. NaClO_4 . The ozone content of the hydrogen developed in the course of electrolysis which in the processes hitherto employed amounted to about 1.5 grs. per cb. metre, is, under the conditions described, reduced to an average of 0.50 grs. per cb. metre. The wear of the platinum anodes is similarly reduced from 10–12 milligrs. per kg. of NaClO_4 produced to 3 milligrs. per kg. NaClO_4 .

I claim:

1. In the production of sodium perchlorate the steps which consist in electrolyzing a solution containing at the start at least 800 grs. sodium chlorate per litre at a temperature between about 40 and 50° C., introducing more sodium chlorate into said solution in a measure sufficient to maintain the concentration of the sodium chlorate in said solution at a point not far below saturation, with respect to said salt, pending electrolysis, until the solution contains about 1000 grs. NaClO_4 and 150 grs. NaClO_3 per litre, and finally pursuing electrolysis of said solution, until the chlorate content of the electrolyte amounts to not more than about 1.5 percent of the perchlorate present.

2. In the production of sodium perchlorate

the steps which consist in electrolyzing a solution containing at the start at least 800 grs. sodium chlorate per litre, at a temperature between about 40 and 50° C., continuously introducing more sodium chlorate into said solution in a measure sufficient to maintain the concentration of the sodium chlorate in said solution at a point not far below saturation, with respect to said salt, pending electrolysis, until the solution contains about 1000 grs. NaClO_4 and 150 grs. NaClO_3 per litre, and finally pursuing electrolysis of said solution, until the chlorate content of the electrolyte amounts to not more than about 1.5 per cent of the perchlorate present.

In testimony whereof, I affix my signature.

UDO EHRHARDT.

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