

## Title (en)

Method for the electrolysis of alkali chlorides with oxygen consumption electrodes

## Title (de)

Verfahren zur Elektrolyse von Alkalichloriden mit Sauerstoffverzehrelektroden

## Title (fr)

Procédé destiné à l'électrolyse de chlorures alcalins avec des électrodes d'alimentation en oxygène

## Publication

**EP 2639337 A2 20130918 (DE)**

## Application

**EP 13158544 A 20130311**

## Priority

DE 102012204040 A 20120315

## Abstract (en)

The process for electrolysis of alkali metal chlorides with an electrolysis cell such as a falling-film cell having an oxygen-consuming electrode, operated according to a finite gap arrangement, is claimed. The electrolysis cell includes an anode space with an anode and an anolyte comprising alkali metal chloride, an ion exchange membrane, a cathode space with an oxygen-consuming electrode as a cathode that comprises a silver-containing catalyst, and an electrolyte gap between oxygen-consuming electrode and membrane through which the catholyte flows. The process for electrolysis of alkali metal chlorides with an electrolysis cell such as a falling-film cell having an oxygen-consuming electrode, operated to a finite gap arrangement, is claimed. The electrolysis cell includes an anode space with an anode and an anolyte comprising alkali metal chloride, an ion exchange membrane, a cathode space with an oxygen-consuming electrode as a cathode that comprises a silver-containing catalyst, and an electrolyte gap between the oxygen-consuming electrode and the membrane through which the catholyte flows, where an application of electrolysis voltage between anode and cathode is preceded by adjustment of the volume flow rate and/or composition of the catholyte supplied to the gap to result in an aqueous solution of alkali metal hydroxide leaving the cathode gap having a content of chloride ions of 500 parts per million (ppm). The electrolysis voltage is applied after introduction of the anolyte and of an oxygen gas into the cathode space. The alkali metal hydroxide solution introduced in the catholyte feed before application of the electrolysis voltage has a content of alkali metal chlorate of 10 ppm. Duration between the introduction of the catholyte and the application of the electrolysis voltage is 150 minutes. A temperature difference between anolyte feed and catholyte drain of less than 20[deg] C is established after the introduction of the catholyte and anolyte. At the end of the electrolysis operation, after the electrolysis voltage is switched off, the alkali metal chloride solution is removed from the anode space, then the anode space is flushed with fresh alkali metal chloride solution until the chlorine content of oxidation state  $\geq 0$  in the anolyte is less than 10 ppm, then the anolyte temperature is lowered and then the anolyte is released from the anode space in a first step and in a second step, the introduction of the catholyte is ended and the catholyte is released from the electrolyte gap. The draining anolyte has 4-4.6 mol/l of alkali metal chloride. The electrolysis voltage is switched off after attainment of chlorine content in the anolyte of less than 1 mg/l. A positive pressure of greater than 10 mbar relative to the anode space is maintained until the emptying and flushing steps are ended in the cathode space. A discharge of the electrolysis cell is repeated at intervals for 4-8 weeks, the anode space has 2.2-4.8 mol/l of dilute alkali solution, and the cathode space has 4-10 mol/l of alkali metal hydroxide solution.

## Abstract (de)

Es werden Verfahren zur Elektrolyse von Alkalichloriden mit Sauerstoffverzehrelektroden mit besonderen Betriebsparameter für die Inbetriebnahme und Außerbetriebnahme beschrieben, bei deren Einhaltung Schäden an Bestandteilen der Elektrolysezelle vermieden werden.

## IPC 8 full level

**C25B 1/46** (2006.01); **C25B 9/19** (2021.01)

## CPC (source: EP US)

**C25B 1/46** (2013.01 - EP US); **C25B 9/19** (2021.01 - EP US); **C25B 15/02** (2013.01 - EP US)

## Citation (applicant)

- WO 0157290 A1 20010809 - UHDENORA TECHNOLOGIES SRL [IT], et al
- JP 2004300510 A 20041028 - MITSUI CHEMICALS INC, et al
- US 4578159 A 19860325 - MILES RONALD C [US], et al
- US 4364806 A 19821221 - ROGERS DOUGLAS K
- WO 2008009661 A2 20080124 - UHDENORA SPA [IT], et al
- MOUSSALLEM ET AL.: "Chlor-Alkali Electrolysis with Oxygen Depolarized Cathodes: History, Present Status and Future Prospects", J. APPL. ELECTROCHEM., vol. 38, 2008, pages 1177 - 1194, XP019606285
- LIPP ET AL.: "J. Appl. Electrochem", vol. 35, 2005, LOS ALAMOS NATIONAL LABORATORY, article "Peroxide formation during chlor-alkali electrolysis with carbon-based ODC", pages: 1015

## Cited by

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## Designated contracting state (EPC)

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## DOCDB simple family (publication)

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## DOCDB simple family (application)

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