

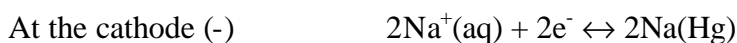
The chlor-alkali industry

Twenty-nine million tonnes or more of chlorine are used throughout the world each year, and for the large-scale extraction needed to provide this quantity of the element a very efficient manufacturing method is needed.

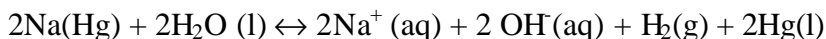
Chlorine is used as a cheap industrial oxidant in the manufacture of bromine, as a bleach and a germicide, but more importantly it is vital for the manufacture of everyday materials.

The production of chlorine by electrolysis of brine (a concentrated solution of rock salt in water), and the associated production of sodium hydroxide and hydrogen, is the basis of the massive **chlor-alkali industry**. A flowing mercury cathode is used, and the sodium produced dissolves in the mercury to form an amalgam. After extracting the sodium, the mercury is recycled. The use of mercury in this way means that all the products of the process are useful. It also means that no energy input is required to produce the liquid metal for the electrode, as mercury is liquid at room temperature.

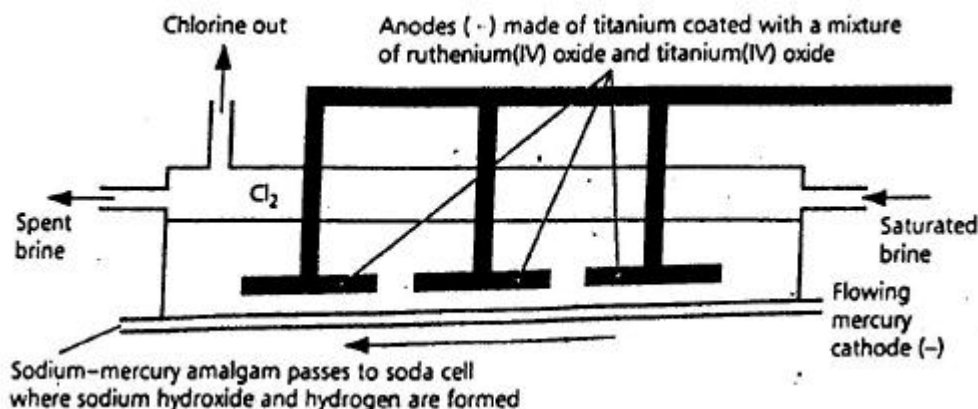
During the electrolysis, chlorine is produced and liberated at the graphite anodes, and sodium is produced at and dissolves in the mercury cathode.



The chlorine is collected and pressurised for storage, whilst the sodium-mercury amalgam passes on into a second "soda cell". Here the sodium reacts with water to form sodium hydroxide solution (caustic soda) and hydrogen:



Thus three products of immense use to the chemical industries are made, and the mercury cathode is ready to be used again.



1. Describe the method of chlorine, sodium hydroxide and hydrogen production by using the mercury cell shown above.
2. Why has this method often been called the "perfect process", and how might you criticise this Statement?

Text and figures: Ann and Patrick Fullick, Chemistry, Heinemann Educational Publishers, Oxford, S. 180ff

to coat (v): überziehen, large scale (adj.): großer Maßstab, germicide (n): antibakterieller Wirkstoff, to liberate (v): freisetzen, manufacture (n): Herstellung, efficient (adj.): wirkungsvoll