Improving the electrochemical production of hydrogen peroxide

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Hydrogen peroxide (H_2O_2) production is estimated at 4.7 Mton annually by 2017. It is used in various applications such as paper and pulp bleaching, textile bleaching, production of chemicals and environmental applications. Currently, it is industrially produced via the anthraquinone autoxidation process. However, we have shown that with our electrolyser approach (see Figure 1) ~10% H_2O_2 can be produced. This is sufficient for most applications (~75%), except for the production of chemicals which typically requires much higher H_2O_2 concentrations. Electrochemical production of H_2O_2 does not require any chemicals, and allows decentralized in-situ production, which reduces the need for its handling, transport and storage. Our latest research focused on reducing the production costs by increasing space-time yield of hydrogen peroxide and decreasing the electricity usage. Using more concentrated electrolytes, alternative anion exchange membranes, and a better electrolyser design, we were able to decrease the cell voltage considerably (see Figure 2). The electricity consumption could be reduced below 7 kWh/kg H_2O_2 at the industrial relevant current density of 4 kA/m^2.

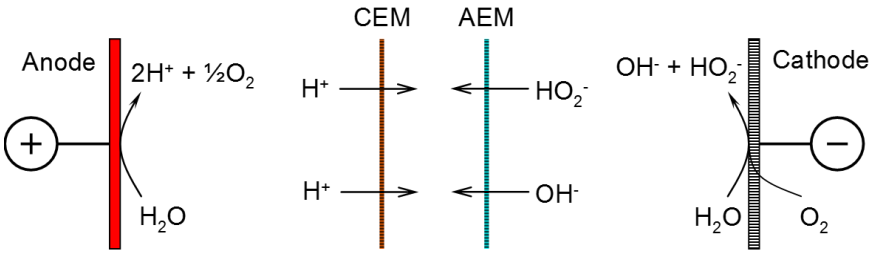

Figure 1: Schematic representation of the H_2O_2 electrolyser configuration.

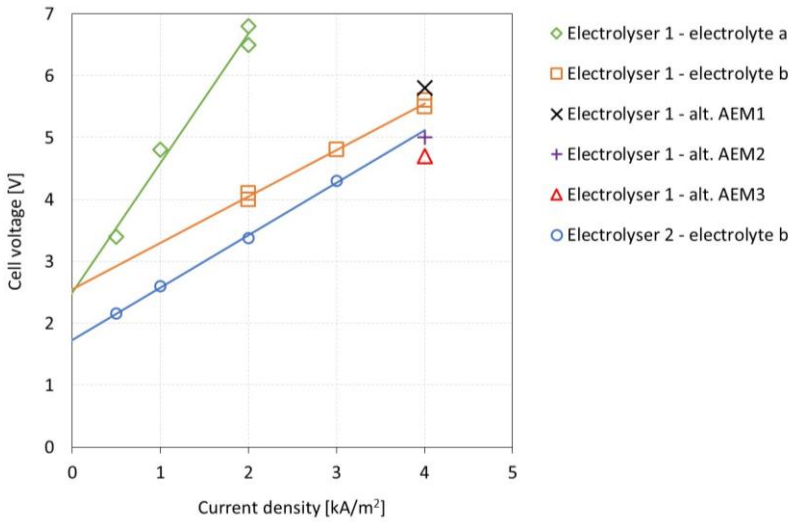

Figure 2: Influence of various parameters on the cell potential.