Ni-Fe-W CATALYST FOR ALKALINE WATER ELECTROLYSIS

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Alkaline water electrolysis is promising technology for producing hydrogen without fossil fuels. The efficiency of alkaline water electrolysis depends on the choice of cell design and materials. Zero-gap assembly is novel cell design with porous electrodes pressed against the membrane. The distance significantly contributes to lower the Ohmic resistance and allow to work with electrolytes with smaller concentration (<20 wt.%). Nickel and its alloys are often applied as electrocatalyst and can reduce energy consumption in the process and speed up the reaction kinetics. The aim of this work was to prepare and study nickel-based catalysts by electrodeposition. Effect of tungsten and iron addition as nickel alloy catalyst was examined.

Ni-Fe-W coatings on nickel foam were prepared by direct current electrodeposition. Optimal parameters such as current density of electrodeposition and composition of electrolyte were studied. Applied current densities were 16 and 8 $A \cdot dm^{-2}$. The electrolyte concentration varied with respect to tungstate content. The prepared catalysts were characterised by means of SEM, EDX and XRD. Efficiency of the catalysts was investigated in a zero-gap electrolyser for alkaline water electrolysis. Electrochemically active surface area (ECSA) of samples was evaluated by cyclic voltammetry.

It was found that electrodeposition is the effective way to influence the morphology and composition of Ni-Fe-W coating. Ni-Fe-W catalyst prepared from electrolyte with 100 mM $Na_2WO_4 \cdot 2H_2O$ reached the highest efficiency compared to the other prepared samples. The results can be explained by the high ECSA value.

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