

Optimization and Scale-up of the Pre-treatment of Nickel Mesh for Improved Electrochemical Properties for Alkaline Water Electrolysis

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Alkaline water electrolysis is a well-established technology employing alkaline media, typically solutions of NaOH or KOH, as the electrolyte. A number of prior studies^{1,2} have investigated the effect of nickel electrode geometry and form factor on electrode performance. In these studies, it is common that a pre-treatment step is included in the experimental procedure. However, to the best of our knowledge, no systematic studies on the effect of electrode pre-treatment have been reported.

This goal of this study is to identify optimal pre-treatment procedures for nickel mesh substrates. The as-received substrates were treated with varying concentrations of HCl solution (ranging from 1 to 5 M). In addition to the concentration of the pre-treatment solution, the duration of the pre-treatment was varied. The resulting treated nickel mesh substrates were assessed for oxygen evolution reaction (OER) activity in a two-electrode flow-through electrolysis cell utilizing KOH (26 wt%) as the electrolyte. The initial screening was carried out using 3 x 3 cm substrates, but the optimised conditions were also applied to \varnothing 35 cm mesh substrates. The best results were seen when the pre-treatment was carried out with 3 M HCl solution for 30 minutes. Scanning electron microscopy images of plain (Fig. 1, left) and pre-treated (Fig. 1, right) demonstrate that the treatment changes the surface morphology of the Ni mesh.

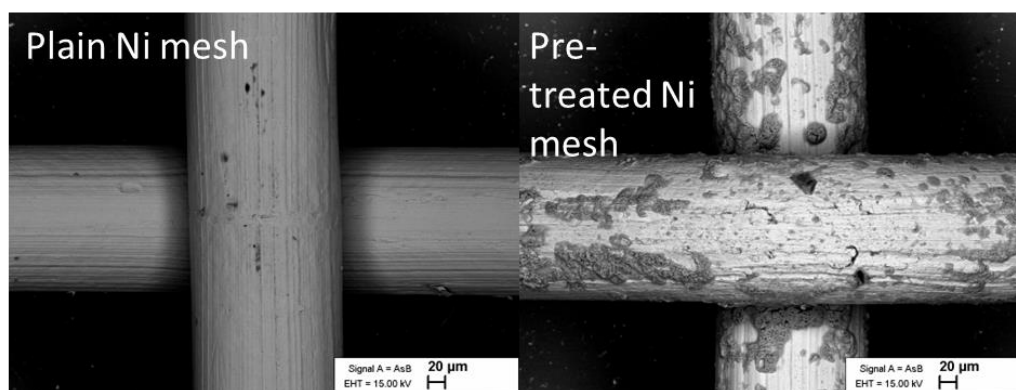


Figure 1. SEM images of plain nickel mesh electrode and nickel mesh electrode pre-treated in 3 M HCl solution for 30 minutes.

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References

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