

Electrode Corrosion in sodium chloride (NaCl) electrolytes during PEF-Treatment

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The examination of electrodes of treatment chambers, used for pulsed electric field (PEF) processing of aqueous liquids, showed macroscopic surface damages after only a few hours of treatment. The electrodes consist of acid-resistant, austenitic Cr-Ni steel (AISI 316Ti / 1.4571). For all investigations rectangular monopolar 40kV/cm pulses with a pulse duration of 1 μ s were applied, administering a specific energy 150 kJ/L to the processed electrolyte. Corrosion was observed after PEF processing of aqueous sodium chloride (NaCl) electrolytes at a concentration of ~ 0.77 g NaCl/L H₂O. The electrodes were processed in treatment periods of 2 h – 10 h, corresponding to 2.16×10^4 - 1.08×10^5 pulses. The obtained electrode mass losses were in the range of ~ 1.0 mg/h (anode) and ~ 0.19 mg/h (cathode). Besides sodium and chlorine, only nickel ions could be detected in the processed electrolytes in significant concentrations of up to 0.28 mgNi/L electrolyte. The remaining corrosion products are present as solid particles. Additionally, results from metallographic investigations of the electrode surface and composition of the erosion products are discussed.