Electrolysis process for water disinfection and hydrogen production

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Wastewater in urban areas is usually processed in municipal wastewater treatment plant before it enters the river. Water being an effluent of this process is devoid of majority of contaminants, however, it is still not fully remediated and drinkable. Electrochemical wastewater treatment might become an additional process to disinfect water from the organic pollutatnts hardly (or too costly) removable by conventional techniques. It can be realized by its oxidation using the hydrogen peroxide synthesized in the process of two-electron water oxidation. Simultaneously, production of hydrogen takes place at counter electrode, which can be further used as an energy carrier in fuel cells.

Two-electron water oxidation to hydrogen peroxide being a competitive process to four-electron water oxidation to oxygen is naturally less thermodynamically preferred, therefore an adequate catalyst is necessary to change this ratio. In this work, molybdenum-based catalyst deposited on nanostructured carbon was suggested for wastewater treatment to increase disinfective properties of the process and reduce the hydrogen evolution overpotential. This non-critical raw material catalyst makes the process more economically viable. Wastewater contaminants was simulated by methylene blue and its concentration was monitored *in-situ* using light absorption spectroscopy during electrolysis process at 3 V. We have noticed that electrode comprising molybdenum(VI) oxide was able to decolour the solution at higher rate than only carbon-based electrode. Although it was more efficient towards water disinfection, less amount of accumulated hydrogen peroxide was detected. Disinfective properties indicate that the lifetime of produced hydrogen peroxide is short and it immediately turns into hydroxyradicals decomposing organics in real time.

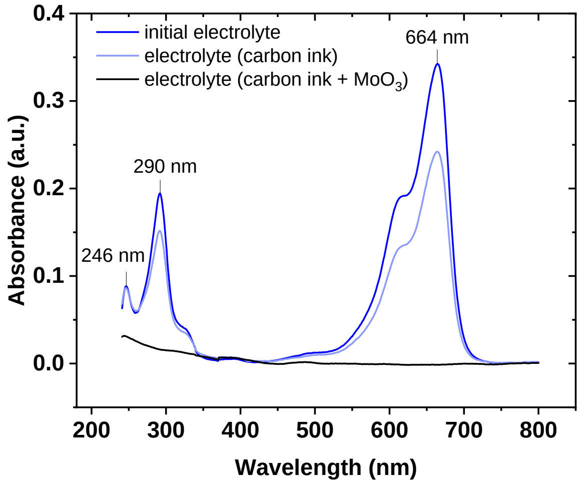

Figure 1: UV-vis spectra of the electrolytes before and after the electrolysis processes using two systems at 3 V during 25 minutes.

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