KINETICS OF THE SODIUM LAURYL SULFATE DECOMPOSITION UNDER THE DISCHARGE WITH ELECTROLITE CATHODE

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High-energy chemistry, including plasma chemical methods, at which the pollutant is bombarded by particles with great energy, are currently recognized as promising methods of wastewater treatment. Many researchers pay attention on the processes of plasma-discharge treatment of organic substances aqueous solutions, еspecially solutions of phenol and surfactants, which are the typical anthropogenic pollutants of the wastewater. The aim of the study was to investigate the mechanism of sodium lauryl sulfate (C12H25SO4Na) decomposition under the influence of a DC glow discharge with electrolyte cathode.

DC discharge in air at atmospheric pressure was excited by dc voltage between the metal anode and the surface of sodium lauryl sulfate solution at the concentration of 5-300 mg/L. Interelectrode gap was 5 mm, the discharge current was varied from 20 to 100 mA, the processing time varied from 30 to 600 s. Details on the experimental setup is described in [1]. The concentrations of sodium lauryl sulfate and its degradation products in the treated solution were determined by fluorimetric and photometric methods. Composition of the gas phase wasn’t controlled during the processing.

 Experimental investigations of the sodium lauryl sulfate decomposition with an initial concentration of 5 mg/L show that the degradation rate increases with time and reaches 90% at the maximum processing time 600 s. The process of sodium lauryl sulfate decomposition is described by the first order kinetic equation with the rate constants K = (5,56 ± 0.62) • 10-3 s-1. It was shown that the discharge effect leads to pH decreasing from 6.2 to 3. The formation of hydrogen peroxide in the solution was determined. The concentration of H2O2 increased with the treatment time increasing and reached a value of 42.5 mg/L. This fact is consistent with previous studies of similar plasma-solution systems [2]. The dependence of the initial concentration and discharge current on sodium lauryl sulfate decomposition rate was investigated. It was shown that increasing of discharge current leads to intensification of destruction process. Degradation rate reaches 98 % with the discharge current value of 100 mA. This fact can be explained by the grows of active particles number and evaporation of the solution. Increasing of initial concentration gives the opposite effect and results in reduction of decomposition rate to 40% (at a concentration of about 300 mg/L). The possible mechanism of the decomposition processes was proposed.

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