ANALYSIS OF HYDROXYL RADICALS FORMATION IN PROCESSES OF OXIDATION OF ISOPROPYL ALCOHOL TO ACETONE IN AN AQUEOUS SOLUTION TREATED BY COLD PLASMA JET

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The practical interest in cold plasma jets based on atmospheric pressure discharges that has increased in recent years is due to the fact that excited particles and radicals with a high reactivity are formed in such jets, and the jets themselves do not have a destructive effect on materials during plasma-chemical treatment. It is believed that the hydroxyl radical OH is the most reactive radical among reactive oxygen species (ROS). However, its lifetime, for example, in a biological medium is only 10^{-9} s, and the diffusion radius is less than 0.01 μm. The most long-lived form of ROS is H_2O_2, which is also high reactive.

The atmospheric pressure microwave plasmatron with an remote electrode plasma torch with a wide outlet of 2.5 cm in diameter was used. The plasmatron operates at a frequency of 2.45 GHz, has a microwave power in the waveguide of up to 2.5 kW and a power in the torch of up to several hundred watts. In this work, we investigated the production of hydroxyl radicals in an aqueous solution of isopropyl alcohol under the action of an atmospheric pressure cold plasma. For this purpose, the surface of the solution was treated with the plasma jet from the plasmatron plasma torch. During treatment, the plasma of streaming afterglow is carried out from the torch by an inert gas flow (Ar), which is is mixed with air from the surrounding atmosphere. As a result of the interaction of the plasma jet with air, hydroxyl radicals are produced, which, in turn, are transferred by the gas flow to the surface of the solution, where isopropyl alcohol is oxidized to acetone.

An analysis of the acetone was conducted by a chromatograph as well as estimation of concentration of hydroxyl radicals in the plasma jet was made. In addition, a study of the production of nitrogen dioxide NO_2 in the cold plasma jet was conducted. For this, a surface of clean water was treated with the jet, and nitric and nitrous acids are formed as a result of chemical reactions in water. Concentration of the acids was also analyzed by the chromatographic method.

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