KINETICS DESTRUCTION OF PHENOL AND PRODUCTS of its DESTRUCTION IN AQEOUS SOLUTIONS UNDER ACTION OF ATMOSPHERIC PRESSURE DBD IN OXYGEn

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It is known that phenols are the one of the most extended toxic pollutant of industrial plants wastewaters [1]. The problem of industrial wastewaters purification from dissolved organics is the most important and hardly solved problem. That is why the development of new efficient and economically sound technologies is very important. Among numerous directions of solving environmental problems the methods based on application of high energy chemistry are of great interest. One of most prospective method is the method based on the non-equilibrium plasma application. Undoubtedly, these methods will be the foundation of future energy saving technologies of environmental protection. The given study devotes to research of phenol decomposition mechanism in aqueous solution under the action of active species of DBD plasma.

The DBD of industrial frequency of atmospheric pressure in flow type reactor with coaxial system of electrode was used. The scheme of experimental set-up was described by us elsewhere [2]. The solution under treatment flowed on the internal electrode covered with hydrophilic material in a film mode under the action of gravity. The discharge burned in a gap between glass dielectric barrier and internal electrode so that the solution was in direct contact with discharge zone. Technical grade oxygen of 3.2 cm3/s flow was plasma-forming gas. The residence time of solution with discharge was changed in the range of 2-12 s. The experiment was carried out for different discharge currents. The phenol decomposition under those conditions was not studied before.

At the phenol destruction carboxylic acids, aldexydes and carbon dioxide were observed as the main decomposition products. The kinetic curve shape allowed determining which products were intermediate ones and which were the final. The phenol decomposition degree increases in the increase in a discharge current at maximal residence time. It were 96, 98 and 99% under discharge currents of 0.28, 0.38 and 0.56 mA, respectively. The phenol decomposition kinetics was found to describe with the equation of the first order. Determined rate constants were increased with discharge current. The content of formaldexyde and carboxylic acids was measured as well. Studies showed that the yield of destruction products is increased with discharge current.

References

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