

Coupling of Dielectric Barrier Discharge with Fenton's System in Pollution Control of Water Environment

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Abstract: This paper, being based of the own research results of the authors and a comprehensive investigation of available literature and patent information, is focused on analyzing the perspectives of the application of integrated approach for the advanced oxidative degradation of toxic organic pollutants, including micro- and nano-plastics. The authors recognize that the application of the separate treatment methods, especially in case of waters polluted with xenobiotics, persistent organic substances, microplastic particles, etc. is in many cases insufficient and will not allow reaching the target results, when complete decomposition of toxic ingredients to the neutral, simple inorganic salts, gases and water molecules, is needed. One of the promising trends in water treatment is application of combined technologies, providing synergetic effects, often of chemical, physical or biochemical nature, in treating waters containing poisonous pollutants [1]. A review provided in this paper demonstrates the higher efficiency of such integrated approach, coupling two or more treatment technologies. This approach specifically combines the Fenton's system and the "cold plasma" (dielectric barrier discharge - DBD) technology for the degradation of toxic organic pollutants in liquid waste streams. The advantages of Fenton's reaction imply using of environmentally friendly chemicals, whereas the DBD technology provides high treatment efficiency and rate [2,3]. Both technologies are marked with the easy operation and practical implementation. A detailed review is provided on the mechanisms, pathways, properties of generated intermediates and active species, during the advanced oxidation treatments. The advantages and limitations of these methods for treating industrial wastewater and emissions to protect natural ecosystems from the impact of toxic organics and microplastics are highlighted, with the specific focus on the coupled Fenton-DBD systems.

Keywords: Fenton's system, Dielectric barrier discharge, toxic organic pollutants, catalysts, integrated water purification technology, microplastics, aquatic ecosystems.

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