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NOVELTY PILLARED CLAYS FOR THE REMOVAL OF 4-NITROPHENOL BY CATALYTIC WET PEROXIDE OXIDATION

Abstract. One solution passes through the study of wastewater treatment by catalytic wet peroxide oxidation (CWPO).In this work, catalysts based on pillared clays with Zrcations have been prepared from nature clays of Kazakhstan, which were obtained from Zhambyl region of Karatau,Akzhardeposit, to be tested in catalytic oxidation of 4-nitrophenol, used as amodel pollutant. The Zr-pillared clay showed higher activity than nature clays in 4-nitrophenol oxidation.

Keywords: pillared clays, catalysis, catalytic wet peroxide oxidation, 4-nitrophenol, hydrogen peroxide.

Introduction. The years of independence in Kazakhstan have become the formationyearsof a completely new state system for ensuring environmental safety, environmental management and nature management - a well-organized and territorially ramified system of executive bodies in the field of environmental protection in the Republic of Kazakhstan. However, for many decades, Kazakhstan has been developing a raw material system of nature management with extremely high man-caused environmental stresses. Therefore, the most contaminated rivers Irtysh, Nura, Syrdarya, Ili, Lake Balkhash [1, 2]. Groundwater is also contaminated, which is the main source of drinking water supply for the population [3]. In European legislation,4-nitrophenol (4-NP), is one of 114 priorities of organic pollutants, 11 toxic and bio-refractory compound that candamage to the central nervous system, liver, kidney and blood of humans and animals. Its high stability pushes you out of undesirable consequences[4].The mechanism of 4-NP oxidation by techniques, such as photocatalysis, Fenton and intensified Fenton, involves the occurrence of oxidized intermediates, namely catechin, hydroquinone, 1,2,4-trihydroxybenzene and benzoquinone [5-8].

Zhanget al. [9], was done experiments on the photo oxidation of 4-nitrophenol (4-NP) in water by UV/H_2O_2 and the results showed that 4-NP in photo degradationis well. Also, 4-NP was tested on CWPO with rGOH in work [10] and was showed as reaction intermediates are hydroquinone, benzoquinone, catechol and several low molecular weight carboxylic acids (e.g., malonic, malic, maleic and acetic acids).

Pillared clays (PILCs) prepared with difference metal cationshave been alsotestedasacatalystfor the degradation of 4-NP with hydrogen peroxide. Pillared clays with Al–Fe, Al–Cu and Al–Cu–Fe used to degradate4-NP, following the evolution of reaction by measuring the pollutant, total organic carbon (TOC) and chemical oxygen demand (COD) removals (%) [11].Nowadays, the PILCs have received increased interest due to the low cost to obtain them and their textural and catalytic properties, resulting in effective materials to be usedas adsorbent or catalyst in wastewater treatment [12-15]. The pillared clay is