УДК 628.3

MODERN METHODS FOR PURIFYING PHENOL FROM WASTE WATER

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В данной статье впервые проведена фотохимическая диссоциация фенола с наночастицами GO / TiO2, продолжительность снята на 1 час, а фотохимическая диссоциация с УФ-излучением раствора подтверждена. Кроме того, состав и количественный анализ раствора фотолиза для получения более точных результатов определяли методом газовой хроматографии, масс-спектроскопии и 40,8% разложение фенола было подтверждено.

Introduction

In recent times, the decrease in the sources of fresh water and growing amount of wasted water therefore increases demand for clear water or distilled water. By this point, different distillation methods are offered. For impossibility of classical chemical, physical and biological ways which are known to us, preparation and investigation of new methods is in process phase. By this way with usage of nano parts it has been gotten achievement in cleaning dirty water. By this point the effective cleaning methods which are related to using nanoparticles start to have widespread character. When we look at world literature, we can see that in the recent years, we can face with distillation ways over nano particles [1-3].

The GO/Al_2O_3 nanoscale composition was prepared for the spin-closing base of three of the dirty waters of the phenol; Then the graphineoxide is covered with solid Al_2O_3 nano composites. On the basis of this composite, it was possible to remove the phenol from dirty water with 99,9% result.

As it is known, phenol is always found in waste waters as it emerges during coal processing, petroleum chemistry, medicine, plastic, paint, and paper production [4]. Phenol is generally considered to be one of the most important hazardous pollutants due to high toxicity due to biological degradation, high concentrations and long-term environmental damage [5-6]. In the present day, gradual reduction of clean water and increased pollution are urgent environmental problem in the world. Millions of people around the world are suffering from fresh water. In general, phenol, which is the most important of water pollutant, creates serious environmental problems. Until now, many methods have been used to remove phenol from waste water. Generally, there are three basic methods: physical, chemical and biological methods [7-8]. Chemical processing methods are environmentally harmful intermediates.

Biological treatment methods are less effective in accelerating biological reactions [9-10].

Physical cleaning is mainly used with adsorption and membrane filtration [11-12]. Membrane filtration is a unique way to remove contaminants from water.

Currently, focus is on membrane filtration, such as energy efficiency for water treatment and an ecologically efficient process.

To this end, the GO has been used recently [13-14]. Soil Oxide (GO) is a graphite oxidizing product with carbonyl and carboxyl group having a partial epoxy and hydroxyl group along its edges.

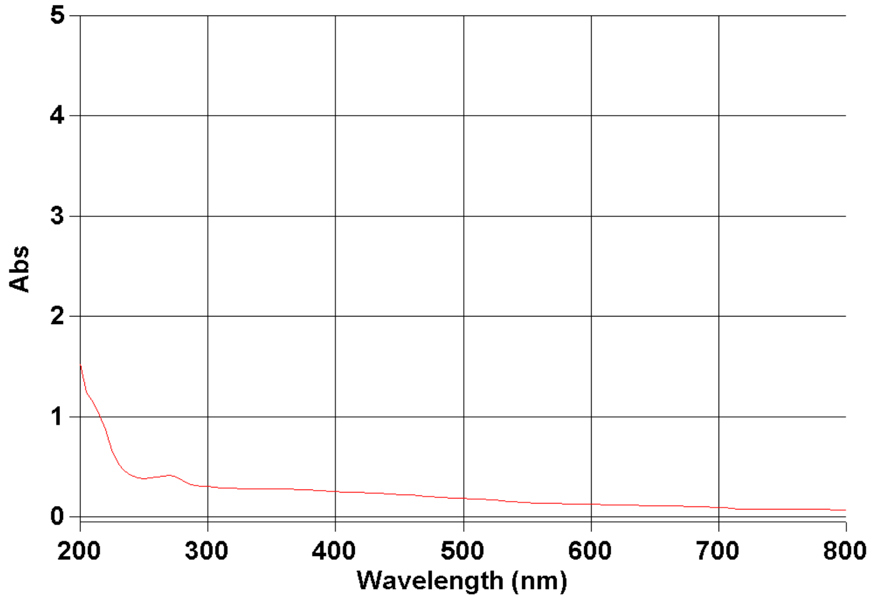
GO is a highly appreciated product in the membrane materials for cheap and simple production process, good chemical stability, mechanical strength and purity of pollutants [15]. Many studies have shown that the GO membrane has very good ionic and molecular selectivity and water permeability [16]. Based on many studies, there are scientific findings for GO to treat phenol from waste water. From this point of view, new composites based on the Go are in a circle of fear. Therefore, the acquisition and use of a new membrane based on GO is of great importance. The newest accepted GO/Al_2O_3 composite membrane in the world literature was purchased for this purpose. This method is a simple and costly method, more attention [17]. The use of a GO/Al_2O_3 composite membrane for the removal of phenol from water solvents has been determined by separation applications. There are many models of grape oxide structure. The most common structure of GO is shown below: GO is considered a very good adsorbent based on the presence of active functional groups.

Experiment and analysis of results:

As mentioned earlier, there is not much study on the purification of phenol from waste water in the presence of nano composites in the literature.

For the first time, a GO/TiO_2 composite was used to treat phenol from waste water. For this purpose, the weight of GO and TiO_2 is equal to 0.05 g and 10 ml of distilled water. Mixing of the nanoparticles in the distilled water to be known, complete mixing in the presence of X-rays was carried out. The GO / TiO_2 composite was used as adsorbent in 2 mg / l phenol solution and also based on photochemical decomposition. A mixture of 20 ml of 2 mg / l phenol and 5 ml of GO/TiO_2 mixture was subjected to photochemical dissolution within 1 hour. After photolysis, the UB radiation device showed the absorption dependence of the wavelength of the solution. Photolytic decomposition has been proven on the basis of the curves taken. Quantitative mass chromatography of the phenol before and after the procedure was examined by mass spectroscopy and decomposition of phenol was 40.8%. Fluorescence was performed on a UB radiation device and the wavelength absorption coefficient was determined by the Varian device. The sample quantitative analysis was performed in a highly effective Agilent 5975 massive detector equipped with gas chromatography, the results were analyzed using chromatographic clear solvents and water samples were extracted. The hydrogen indicator of the sample was reduced to pH <4 until extraction. The solvent was methylene chloride and dixomethane for extraction.

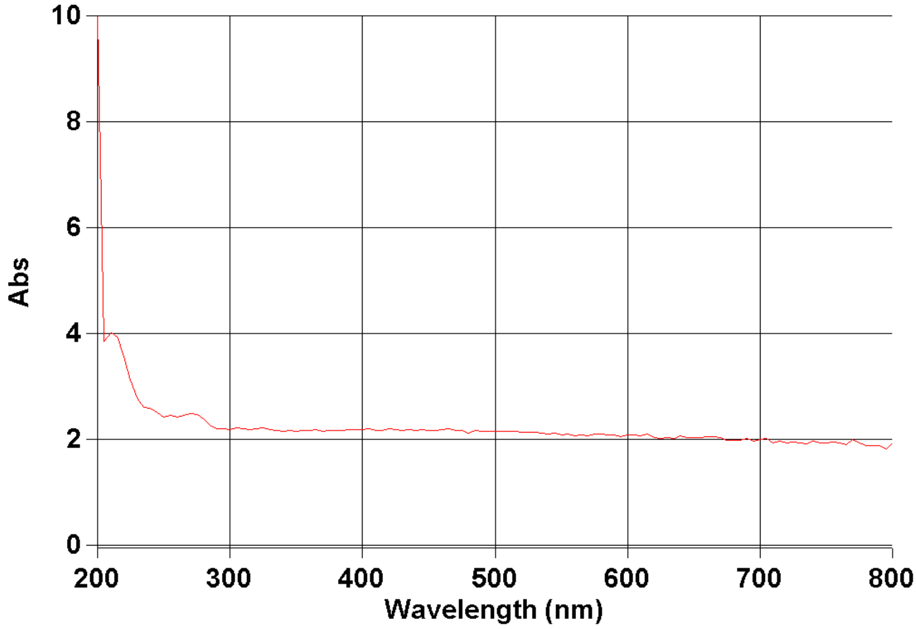
The graph below shows the dependence of the absorption coefficient of the 2 mg/l phenol solution on the wavelength (graph 1). After photolysis, absorption coefficient of UV absorption was determined by using 20 ml 2 mg / l phenol solution and 5 ml GO/TiO_2 absorption coefficient. The graphical curves indicate that the bleaching products in the solution are sufficiently taken.



Graph 1 – UV analysis of 2 mg / l phenol solution

As shown in Graph 1, phenol-like curves were taken at 200-300 nm. It is also known from the literature that the wavelength curve of 270 nanometers indicates the presence of phenol. It can be concluded that the phenol solution is clean due to the absence of other components in the solution.

After photolysis of the phenol solution with the GO/TiO_2 composite, many substances should be taken in the solution based on photochemical degradation. Obtaining many curves at a length of 210-385 nm indicates a plurality of disintegration products (graph 2). This means that the phenol is fragmented and the density of the phenol in the solution is reduced. The amount and composition analysis of the products taken to prove the results were performed by gas chromatography mass spectroscopy (table 1).



Graph 2 – UB analysis of 2 mg/l phenol+GO/TiO2 composite after photolysis

It was determined in less than 2 hours (without photolysis) by absorption of 20 ml of 2 mg/l of phenol solution and 2 ml of GO/TiO_2 solution (10: 1) at room temperature. It should be noted that for the first time experiments are carried out, the optimal conditions are not chosen for the absorption to go fast. Since our aim is to change the reactions of the photolysis process, absorption kinetics have not been fully investigated.

After photolysis, composition and quantitative analysis of the solution were carried out by gas chromatography mass spectroscopy (fig. 1).

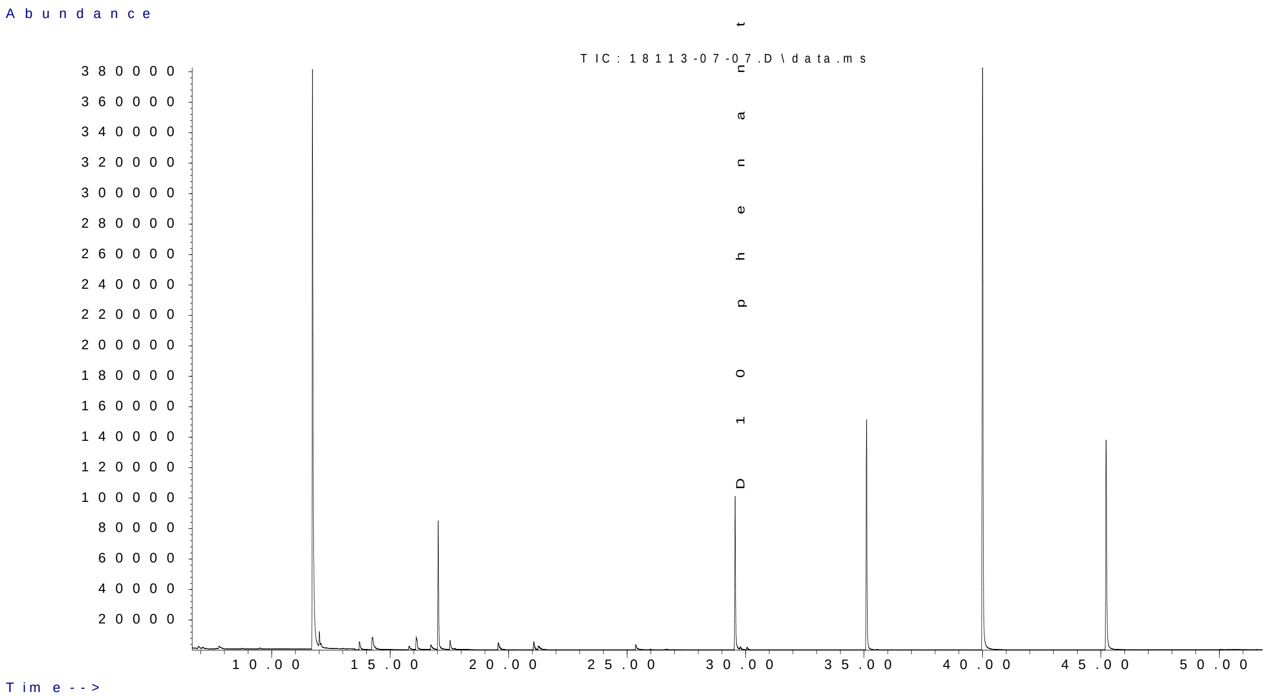


Figure 1 – 2 mg/l phenol +(GO+TiO2) solution total chromatography

As a result, it should be noted that the current pollution of these ecosystems is the most urgent problem of environmental problems in order to protect the environment from polluted water to pure water basins. As a result, the world's fresh water reserves are decreasing. From this point of view, it is important to find new ways to maximize the amount of contaminated water and minimize the amount of toxic substances present there.

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