The impact of excilamps radiation on the photodegradation of some phenol derivatives

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Due to the presence of the OH group and its propensity to form hydrogen bonds, phenol and its derivatives are model compounds, which have been the subject of extensive spectroscopic investigation. The addition of other substituent's is expected to affect the structure and properties of phenol in different ways, depending on its location and its nature. It is also important that phenol and its derivatives constitute a wide class of water pollutants because of their stability and solubility in water. There are many conventional methods to destroy phenols, but each method has its shortcomings. Chemical oxidation methods are expensive and lead to the contamination of water with other toxic pollutants. The biodegradation can only be used for dilute wastewater. Ultraviolet (UV) radiation with quantum energy comparable to the energy of a chemical bond is the unique tool for initiating and performing many physical and chemical processes on the surface and in the volume of various media. UV radiation can be used not only for disinfection of water and air, that is, for removal of pathogenic microorganisms, but also for decomposition of complex organic compounds. In this regard, a study of the efficiency of different UV radiation sources that may influence various electronically excited states of organic molecules becomes relevant. Such sources are exciplex lamps that are increasingly used for toxicant photolysis [1]. The influence of UV radiation on the spectral properties of 2,6-di(hydroxymethyl)-4-methylphenol and 4-cyanophenol in water solutions has been studied. The pulsed excilamps were used as the UV radiation source: KrCl (222 nm), XeBr (282 nm), XeCl (308 nm). It was established that the process of phototransformation of compounds occurred faster when the concentration decreased. The use of the flow-through photoreactor [2] leads to a more effective degradation of the examined compounds than irradiation in the stationary conditions. The degree of photodegradation depended on the exposure time. The effect of hydrogen peroxide and humic acids additives on the processes of phenol photodegradation were also discussed. The method of ecotoxicant photodegradation with application of UV radiation sources can be used both independently and in combination with other modern technologies.

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[1] A.M. Boichenko et al., *Techn. and Appl.* [in Russian] **2011**, STT, p. 512.

[2] N.O. Vershinin et al., *J. Appl. Spectrosc.* **2013**, *80*, pp. 600–603.