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Photocatalytic processes for degradation of endocrine disruptors from wastewater

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The problem of contamination of aquatic environments by estrogenic pollutants starts to be deeply discussed not only in scientific community, but also in general public. The industrial chemicals such as pesticides, PCBs, bisphenol A together with natural and synthetic estrogens such as 17-ethynylestradiol (EE2) have been found to be potent endocrine disruptors. These substances can negatively affect the hormonal system of animals as well as humans.

The necessity to find alternative solutions for environmental protection leads to the development and use of the new technologies. Photo-catalysis using semiconductor particles seems to be very promising technique to solve the environmental pollution problems. It is well established that titanium oxide and related nanostructure materials in the presence of UV light (in dependence of condition also in the presence of visible-light) can create very active species that are able to restore and preserve a clean environment by decomposing harmful organics.

To judge the application of TiO₂ photocatalysts for water treatment the degradation of 17-ethynylestradiol and bisphenol A in water solution has been studied. Conventionally, TiO₂ suspensions have been used for decomposition of these pollutants in water solution, however an immobilized TiO₂ system is required in order to avoid the need to remove TiO₂ nanoparticles from the treated water. The catalyst with immobilized TiO₂ allows its application in the continual photo reactors as well. In this study TiO₂ catalyst was prepared in the form of glass beads coated by thin layers of TiO₂ by sol-gel technique.

For photocatalysis the UV lamp Philips HOK 4/120 SE, 400 W medium pressure mercury lamp with wavelength 250 - 420 nm was used.

The efficiency of the titania oxide thin layers on the glass beads for degradation of 17-ethynylestradiol and bisphenol A in water solution was studied in the batch disposal and consequently in the continual micro-photo reactor. Experiments were performed regarding to the efficiency of the process and evaluation in the term of toxicity of reaction products.

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