Photocatalytic reactions in a microwave field using an electrodeless discharge lamp
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Microwaves are well known for their heating effects on polar substances and are widely used domestically and industrially. Recently, microwaves have been used to assist photochemical and photocatalytic reactions for degradation of organic pollutants [1]. As a source of light an electrodeless discharge lamp (EDL) which generates ultraviolet radiation after placed into the microwave field is used [2]. Titanium dioxide in anatase form is a well-known photocatalyst. The aim of the research is to prepare titanium dioxide thin films onto the surface of EDL using the sol-gel method based on hydrolysis of titanium alkoxides. The crystal phase of TiO_2 prepared was analyzed by X-ray diffraction and the observed structure phases revealed anatase as the predominant crystalline phase. From Atomic Force Microscope images, the film of TiO_2 was homogeneous with approximately uniform crystallite size. The absorption edge of TiO_2 was detected by UV-Vis spectrophotometer. Specific surface area was determined from adsorption and desorption isotherms of nitrogen at 77 K. The photocatalytic activity of samples prepared was evaluated by degradation of mono-chloroacetic acid using Hg-EDL. Spectral measurements of prepared lamps were carried out on the spectrometer with an optical fiber probe.

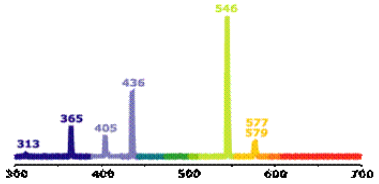

Fig. 1. The emission spectrum of Hg-EDL

Time behaviour of the reaction was analyzed by a chloride ion-selective electrode. This study revealed that the reaction efficiency depends on the intensity of light and initial pH value of the solution. Moreover, the degradation of mono-chloroacetic acid was enhanced in an alkaline solution and in the presence of H_2O_2, and significantly enhanced by increasing the intensity of light. Furthermore, this study also discloses that reaction is not influenced by the number of TiO_2 thin films or by air bubbling.

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