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PHOTOCATALYTICAL APPLICATION OF TiO_2/SiO_2 AND ZINC-ALUMINUM LAYER DOUBLE HYDROXIDE MULTI-LAYERED NANOFILMS PREPARED BY LBL IMMERSION METHOD - in short presentation -

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SHORT PRESENTATION

Multilayered self-assembled films from colloidal particles with constant or variable surface charge were prepared on the surface of glass plates using the "layer by layer" (LBL) immersion technique.

As spherical particles with variable surface charge, TiO_2 photocatalysts and silica sol particles were used for the preparation of multilayered, up to 20-layer films. Lamellar particles of zinc-aluminum layer double hydroxide (LDH) with constant surface charge was a suspension (ZnAl-LDH), which were deposited on the surface of glass plates using the LBL dipping technique.

The multilayer preparation was monitored by absorbance measurements at the wavelength of λ = 500 nm. The buildup of the ZnAl-LDH layers was controlled by XRD measurements. The thickness of the films were found to vary between 40-100 nm in the case of TiO_2, and 150-1000 nm in the case of ZnAl-LDH containing films.

By the photocatalytic experiments a photoreactor equipped with a 400 W high-pressure mercury lamp was applied (Fig. 1). The emitted UV-photons below 320 nm were cut off using glass reaction vessel. Acridine-Orange (AO) organic dye was degraded in the experiments.

A spectrophotometer with a flow type cell has been connected to the reactor in order to measure continuously the absorbance of the organic dye solution, which was circulating at constant rate during the irradiation. The absorbance maximum of the dye at λ = 493 nm gradually decreases, corresponding to the decrease in the concentration of residual AO in the solution, due to degradation, presented on Fig. 2.

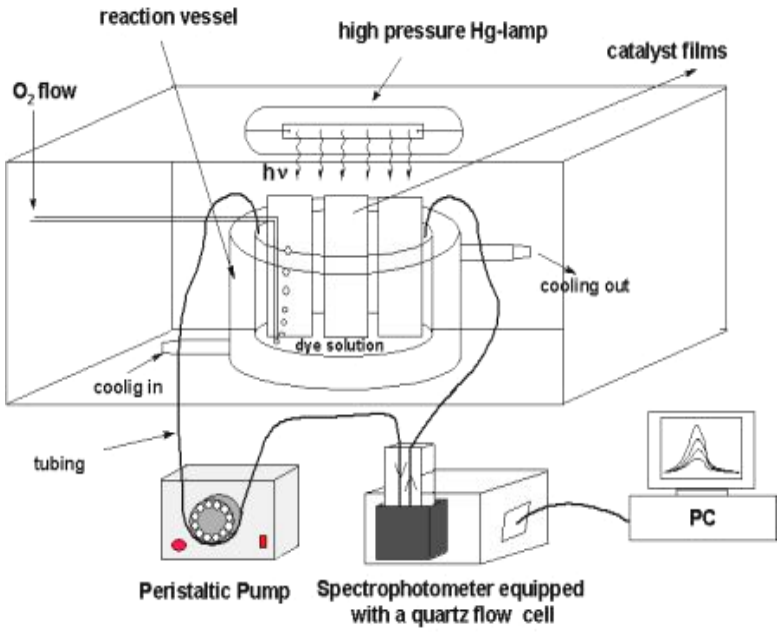

FIG. 1. SCHEMATIC PICTURE OF THE PHOTOREACTOR

The TiO_2, TiO_2/SiO_2 multilayered films and ZnAl-LDH multilayered films (see Fig. 3) were photocatalitically active in the destruction of acridine orange.

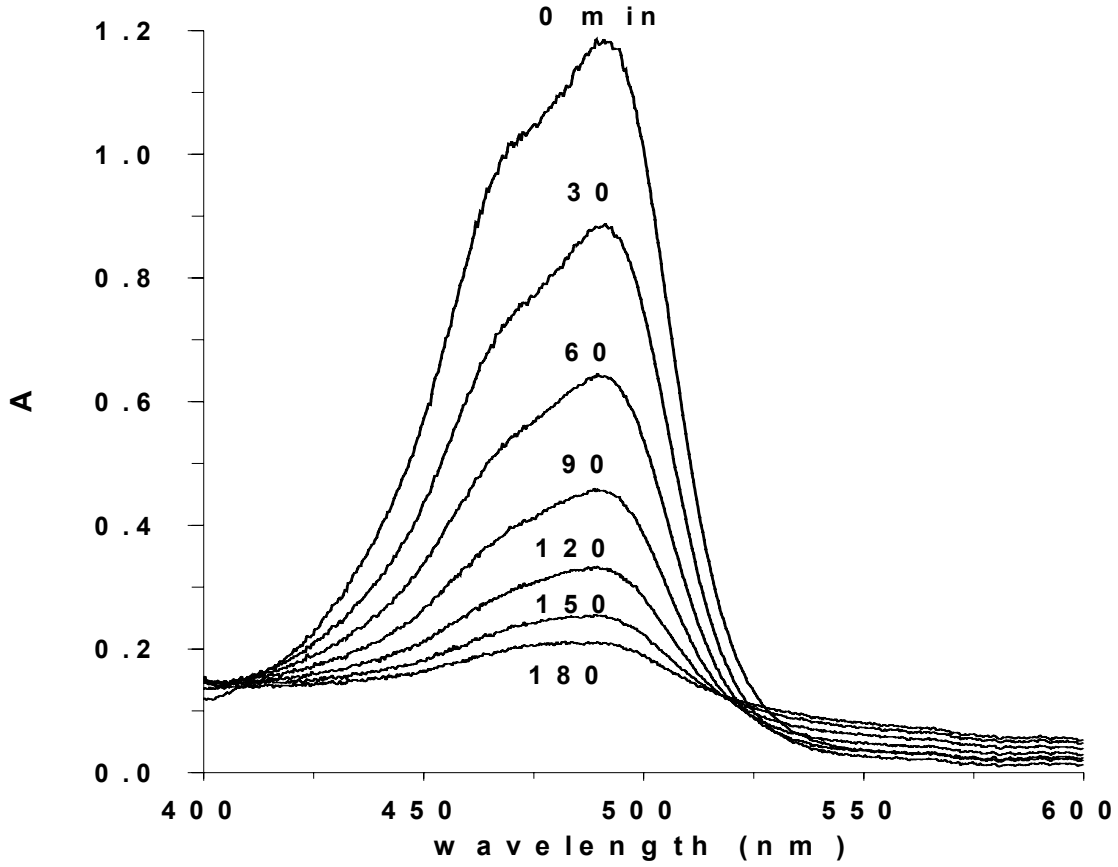

FIG. 2. UV-VIS SPECTRA OF THE AO AQUEOUS SOLUTION AT DIFFERENT IRRADIATION TIME USING 20 LAYERED LDH MULTILAYERED FILMS

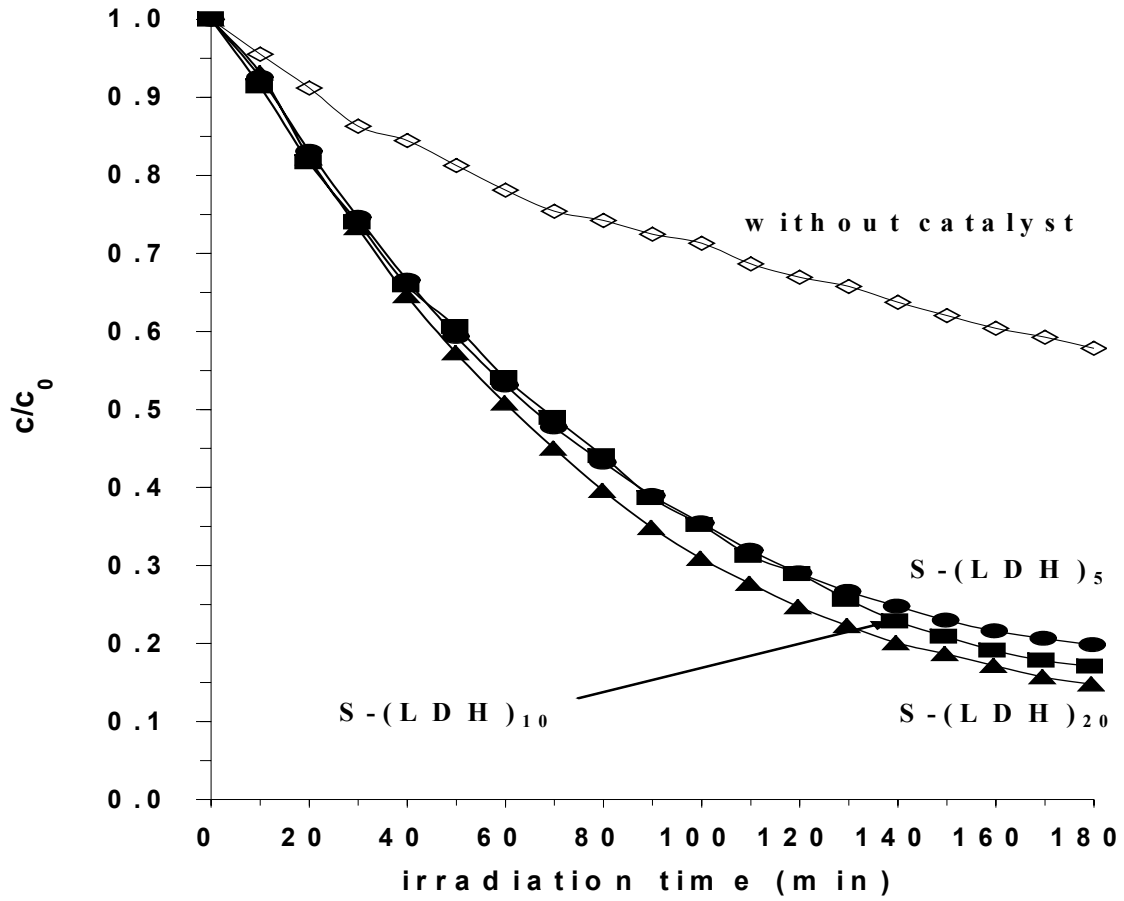

FIG. 3. THE CHANGE IN THE RELATIVE AMOUNT OF THE AO DURING THE IRRADIATION USING LDH CONTAINING MULTILAYERED FILMS WITH DIFFERENT THICKNESSES

The photocatalytic efficiency of the new ZnAl-LDH photocatalyst is close to the well-known P25 Degussa titanium dioxide.