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Unifying Concepts in Catalysis

UniCat Colloquium

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Efficient mineralization of aqueous organic pollutants by photocatalytic ozonation

Photocatalytic ozonation process using TiO_2 photocatalyst ($O_3/TiO_2/UV$ – PH-OZ) conducted in acidic water environment often leads to synergistic effect in terms of decomposition and mineralization of aqueous organic contaminants, which makes the process suitable for waste water treatment or pretreatment of drinking water. The synergism is among other factors (pH, O_3 dose, T,…) greatly influenced by photocatalyst physicochemical properties and pollutant type. In the first part of the study, five different commercial TiO_2 photocatalysts (P25, PC500, PC100, PC10 and JRC-TiO-6) were used in $O_2/TiO_2/UV$, O_3/TiO_2 and $O_3/TiO_2/UV$ advanced oxidation systems for degradation of two pollutants (dichloroacetic acid - DCAA and thiacloprid – neonicotinoid pesticide), simultaneously present in water solution. Results of PH-OZ ($O_3/TiO_2/UV$) experiments showed that in contrast to DCAA which adsorbs on TiO_2 surface, synergistic effect is much more expressed in the case of thiacloprid which doesn't adsorb. The influence of BET surface area of the photocatalyst and its dispersivity will be discussed.
In the second part of this study, selected catalysts were immobilized on a proper support to avoid post-filtration step in the process of greywater treatment. A good adhesion of a catalyst on various supports was successfully achieved by immobilization of commercial TiO_2 powders (P25, P90, PC500) with the help of a sol-gel silica-titania binder. For the purpose of simulated greywater treatment, special compact reactor was designed and developed, utilizing Al_2O_3 porous reticulated monolith foams as TiO_2 carriers and UVA-lamps inside. With degradation of LAS+PBIS and Reactive blue 19 (RB 19) as representatives of surfactants and textile dyes respectively, commonly found in household greywater, and phenol as trace contaminant, an evaluation of PH-OZ and photocatalytic oxidation has been performed. Synergistic effect of PH-OZ was generally much more expressed in mineralization reactions, showing TOC half lives of less than one hour for the mixture of pollutants in compact reactor. Due to its superior cleaning capacity, PH-OZ process employing efficient photocatalysts is suitable for treating wastewaters also with higher loading of organic pollutants.

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TU Berlin, Institute of Chemistry
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Building C, Lecture Hall **C 264**

Prof. Dr. Schomäcker (TUB)
Organizer

Coffee and cake will be served 30 minutes before the lecture. Guests are cordially invited to attend!
Prof. Dr. Matthias Driess - Chair of the Cluster of Excellence UniCat - www.unicat.tu-berlin.de