Photo-catalysis in a fluidized UV-LED bed

Sub-department of Environmental Technology

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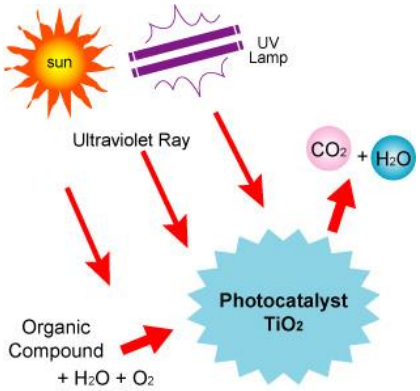
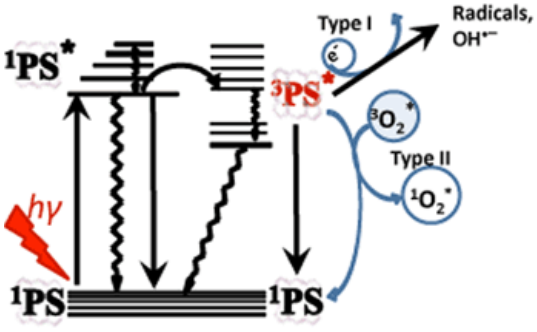
Motivation

The presence of micro-pollutants, such as pharmaceuticals and pesticides, in water threaten the safety of water supply. Conventional waste water treatment processes have a low efficacy on micro-pollutants removal. So there is a need for a cheap and effective removal process to treat micro-pollutants containing wastewater. The fluidized LED bed reactor is a new technology. with dispersed LEDs moving freely and wirelessly powered in the photo-reactor that might be a cost effective process to degrade micro-pollutants.



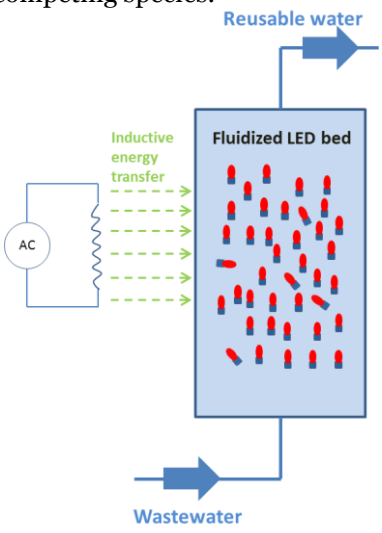


Technological challenge

The energy consumption will be optimized and the operating costs will be lowered. This will be done by designing a smart control system for wirelessly powering the LEDs. Different photo-chemical routes will be studied.

- The use of TiO_2 suspension as a photo-catalyst requires UV-LEDs and a costly post-treatment like ultrafiltration to separate the catalyst. This limitation will be overcome by fixing catalyst (TiO_2) to LEDs, and by employing alternative photo-degradation processes.
- Photo-degradation processes at longer wave lengths such as dye-photo-sensitization with methylene blue involves cheaper red light LEDs.
- UV/H_2O_2 does not use a catalyst at all.

The presence of organic species in real wastewater may compete with target pollutants for adsorption to catalyst surface and reaction with radicals. Dye-photosensitization and UV/H_2O_2 is expected to be an option to minimize the adverse impact of competing species.



❖ This study is carried out at WETSUS

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