

## Summary

Apprication of Visible Light Responsive Titanium Dioxide Photocatalyst to treatment of Landfill Leachate

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Studies on applying the Vis-TiO<sub>2</sub> photocatalyst to treatment of landfill leachate have been carried out. The results obtained are shown as follows;

1. Unique TiO<sub>2</sub> film having layered structure (Vis-TiO<sub>2</sub> /UV-TiO<sub>2</sub>) prepared by the magnetron sputtering deposition methods showed significantly enhanced photocatalytic activity.
2. Simple calcination treatment of Vis-TiO<sub>2</sub> at 400°C in NH<sub>3</sub> was found to be effective in improving the photoelectrochemical performance as well as photocatalytic reactivity of Vis-TiO<sub>2</sub>.
3. The treatment of landfill leachate by photocatalysis with Vis-TiO<sub>2</sub> film under the sunlight cut off the UV rays resulted in COD and TOC reduction.
4. Vis-TiO<sub>2</sub> film showed the degradation of organic compounds in landfill leachate under the visible light of a sunlight condenser with 15 meters long optical fiber cable.
5. A reactor using Vis-TiO<sub>2</sub> film showed highly efficient on the photocatalytic treatment of landfill leachate.
6. Treatment of landfill leachate by UV-TiO<sub>2</sub> film was evaluated using *Daphnia magna* bioassay. The results showed that the photocatalytic treatment, which was capable of degradation of NH<sub>3</sub>, reduced ecotoxicity of landfill leachate.
7. The photocatalytic degradation of bisphenol A, PFOS, and PFOA in water using UV-TiO<sub>2</sub> /silica gel has been investigated. Bisphenol A was completely decomposed within 12 min of the photocatalytic treatment. No degradation of PFOS and PFOA was observed after 90 min of the photocatalytic treatment.
8. The photocatalytic degradation of 1,4-dioxane in water using Vis-TiO<sub>2</sub> under LED light (415 nm) was investigated. About 10 % of 1,4-dioxane was decomposed within 28days of the photocatalytic treatment.
9. Rice and sweet potato plants were confirmed to be grown normally with landfill leachate diluted 1/4 times and would be candidates for fixing CO<sub>2</sub> and producing biomass in landfill areas. Tree species such as oleander were also candidates for planting in landfill areas to purify landfill leachate.

• Keywords ; Visible light-responsive titanium dioxide photocatalyst; landfill leachate;