

Laurea honoris causa

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Lectio doctoralis

Akira Fujishima

Tokyo University of Science

TiO₂ Photocatalysis – Fundamental and Recent Situation

I am very honor to receive Laurea Honoris Causa (Honorary doctor of Turin University).

I appreciate to professors: Rector Prof. Ezio Pelizzetti, Vice Rector Prof. Salvatore Coluccia, Prof. Paolo Venturello, Prof. Claudio Minero and Dr. Monica Accornero.

The tremendous amount of research that has been carried out in the two closely related fields of semiconductor photoelectrochemistry and photocatalysis during the past three decades continues to provide fundamental insights and practical applications. The principles and measurements obtained TiO₂ with photoelectrochemical studies have led to the research activity on heterogeneous photocatalysis, where the strong photooxidative activity of TiO₂ has been applied to environmental cleanup. This resulted in the concept of "light cleaning," i.e., deodorizing, disinfection, and decontamination of air, water, and surface with TiO₂ thin films and light. In 1997, we reported the novel photo-induced superhydrophilicity of TiO₂ and proposed the concept of self-cleaning superhydrophilic properties of TiO₂.

In this lecture, I will follow the history of TiO₂ photocatalysis, outline the contribution of photocatalysis to a comfortable and safe urban environment, and highlight some important points related to the future development of photocatalysis, including the problem of utilizing visible light and the standardization of photocatalytic systems. I will also present our recent situation of photocatalyst materials and applications, especially research center of photocatalysis.

The center provides support for interdisciplinary photocatalytic materials research and education of the highest quality by collaboration among industry, academia, and government under one roof while addressing fundamental problems in science and engineering that are important to green innovation. We will have three groups.

- 1) Artificial photosynthesists group (Demonstration experiment using sun light)
- 2) Self-Cleaning group (Performance evaluation using windows and walls)
- 3) Environmental cleanup group (Environmental cleanup with composite photocatalyst)

References

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- 3) A. Fujishima, X. Zhang, D.A. Tryk *Surface Science Reports*, **2008**, 63, 515.