

## **Photocatalytic activity of TiO<sub>2</sub> nanoparticles prepared from dye wastewater treated sludge by using TiCl<sub>4</sub>**

*Hironori Kaai , Tomoyuki Nakagawa and Hidehiro Kamiya*

*Tokyo University of Agriculture and Technology, Koganei, Tokyo 184-8588 Japan*

*Motoyuki Iijima*

*Graduate School of Environment and Information Sciences, Yokohama National*

*University, Yokohama, Kanagawa 240-8501 Japan*

For industrial wastewater treatment, the adsorption and precipitation methods of organic pollutants in wastewater by flocculants, such as Al<sub>2</sub>SO<sub>4</sub>, FeCl<sub>3</sub> etc., have been used extensively. Precipitated sludge produced in this process are generally incinerated or dumped in disposal facilities. However, new construction of incinerator plant and landfill facility has generally trouble because of the difficulty of neighborhood consensus formation. In this study, we focused on TiCl<sub>4</sub> as an alternative coagulant of Al<sub>2</sub>SO<sub>4</sub>, FeCl<sub>3</sub> for effluent purification. In order to prepare high performance photocatalytic TiO<sub>2</sub> nanoparticles from generated TiCl<sub>4</sub> sludge after real dye wastewater treatment, sludge were dried and heated by various temperature profiles. TiCl<sub>4</sub> aqueous solution was added into real dye house effluent after pH control by H<sub>2</sub>SO<sub>4</sub> solution. After adsorption of organic pollutants in wastewater, the precipitation of TiCl<sub>4</sub> sludge with organic pollutants were accelerated by NH<sub>3</sub>OH addition. By using above process, TiCl<sub>4</sub> is almost same performance as other commercial flocculants, Al<sub>2</sub>SO<sub>4</sub>, FeCl<sub>3</sub>, etc. for wastewater purification. TiO<sub>2</sub> anatase nanoparticles were obtained by heat treatment at ranging from 973 to 1073 K, and the maximum specific surface area was 53.6 m<sup>2</sup>/g. The photocatalytic activity of prepared TiO<sub>2</sub> nanoparticles from sludge was almost equivalent to that of commercial photo catalyst, P25.