Decomposition of organic matters using Photocatalysts

Tark Hyun Koh, Hyeon Do Jeon, Jung Hyeun Kim*

Department of Chemical Engineering, University of Seoul, Seoul, Korea

Abstract

According to water demand is rapidly increasing, more and more sewage is recycled as industrial water for water management and development. Previous methods are harmful for human and have problem in cost. We use titanium oxide as photocatalyst, but its large bandgap is not enough to absorb visible light of the sun. So we have to enhance the surface of titanium and choose as partner. It is widely existed and costs cheap. Our experiment is estimate of our photocatalyst's absorption and ability to decompose MB(pollutant). Proerties of the catalyst were analyzed using TEM, XPS, XRD, and UV-vis.

Experimental

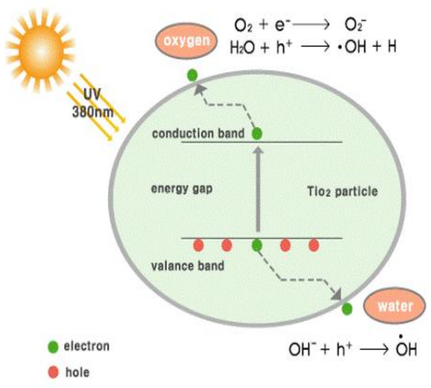


Fig1. Mechanism of TiO_2 Photocatalyst

(1) Exoposure of light

$$TiO_2 + h\nu \rightarrow h^+ + e^-$$

(2) Reaction mechanism in Valence Band

$$h^+ + H_2O \rightarrow OH\cdot + H^+$$

$$h^+ + OH^- \rightarrow OH\cdot$$

(3) Reaction mechanism in Conduction band

$$O_2 + e^- \rightarrow O_2^{\bullet -}$$

$$O_2^{\bullet -} + H^+ \rightarrow HO_2\bullet$$

$$O_2^{\bullet -} + H^+ + HO_2\bullet \rightarrow H_2O_2 + O_2$$

(4) Mechanism of Decomposite MB

$$OH\bullet + MB \rightarrow CO_2 + H_2O$$

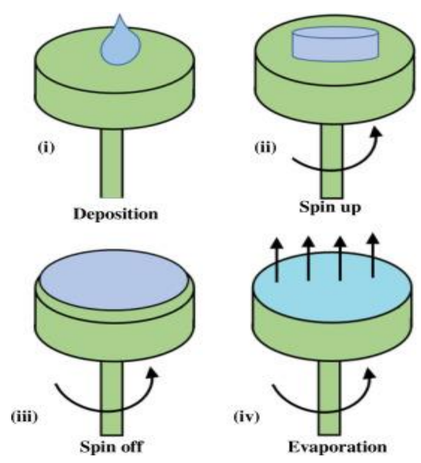


Fig2. Model of spin coater

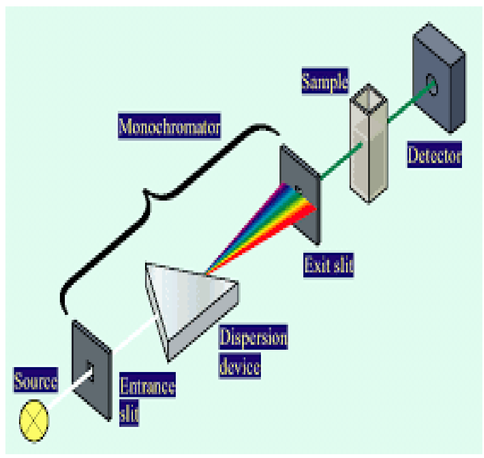


Fig3. Principle of UV-vis measurement

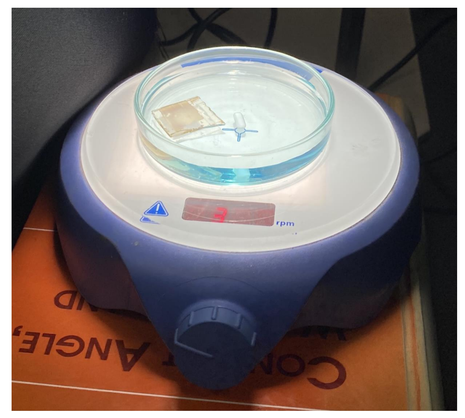


Fig4. Decomposite organic matter

Results & Discussion

▪ Our approach

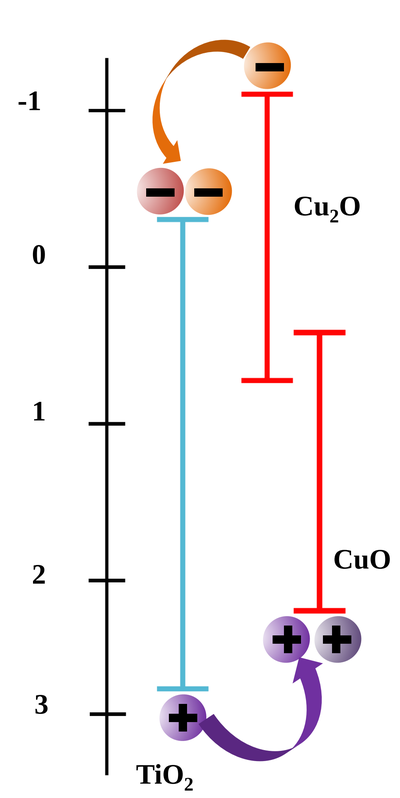


Fig5. Energy gap of TiO_2 spin-coated with copper oxides

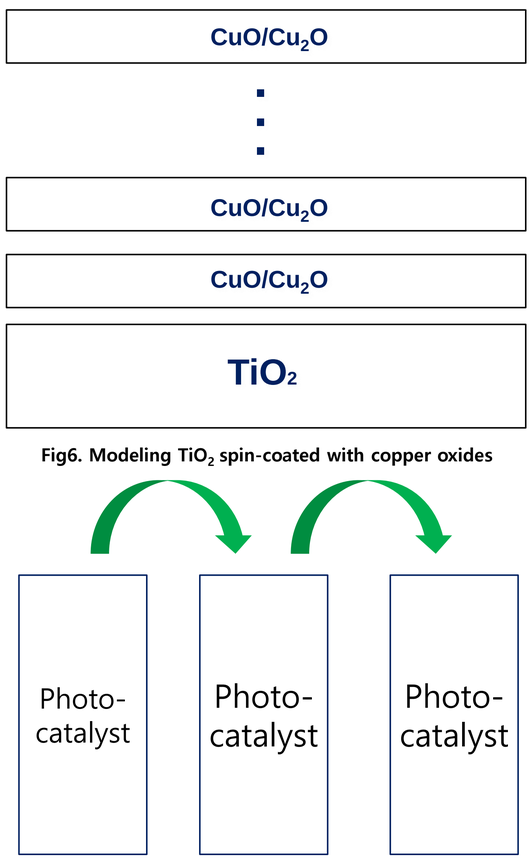
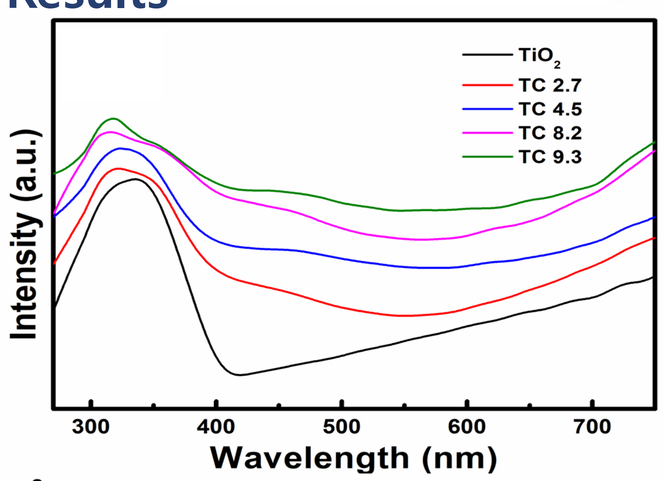
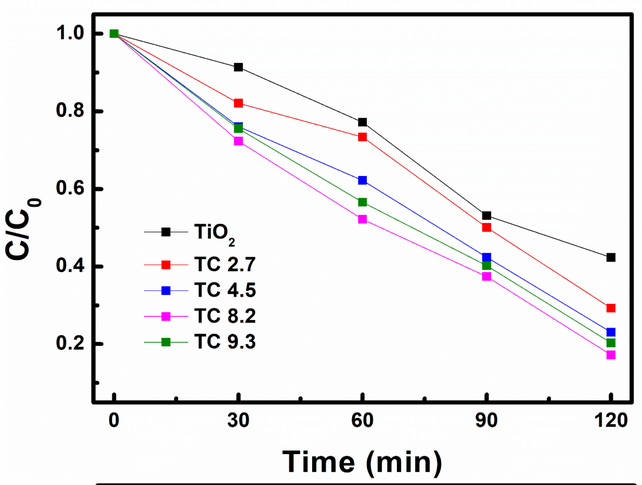


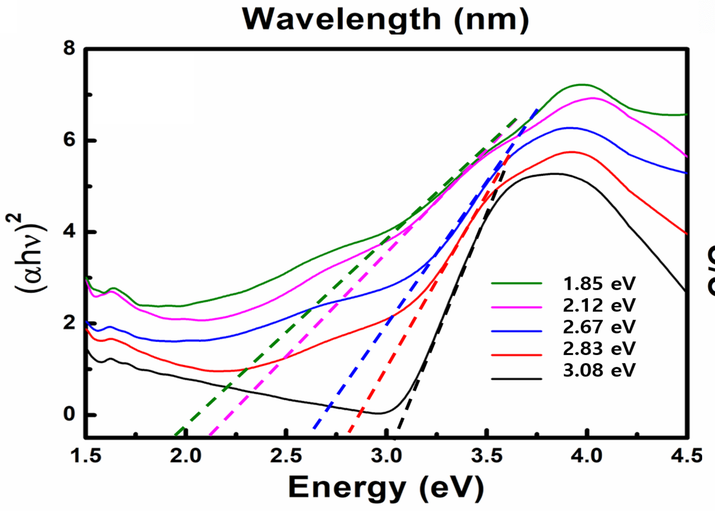
Fig6. Modeling TiO_2 spin-coated with copper oxides

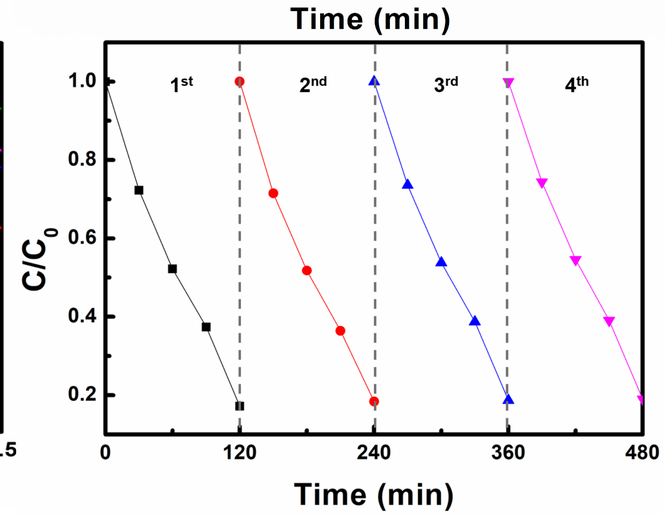
Fig7. Model of recycle Photocatalyst

▪ Results









▪ Measurement

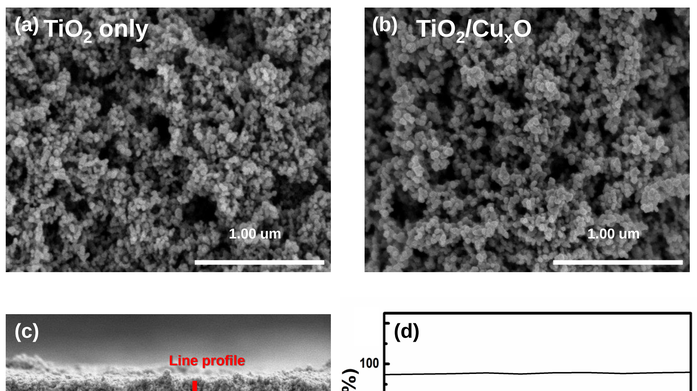


Fig8. picture of TiO_2 coated with Copper oxides using SEM

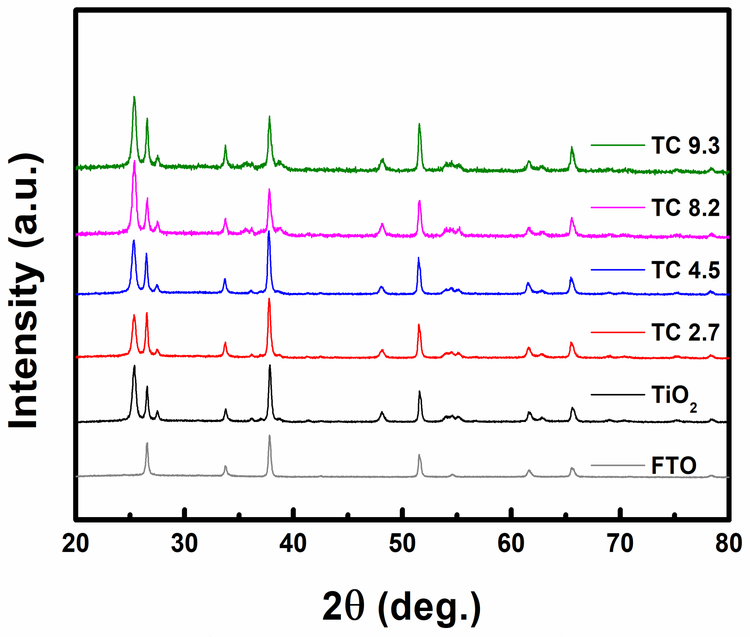


Fig9. Graph of TiO_2 coated with Copper oxides using XRD

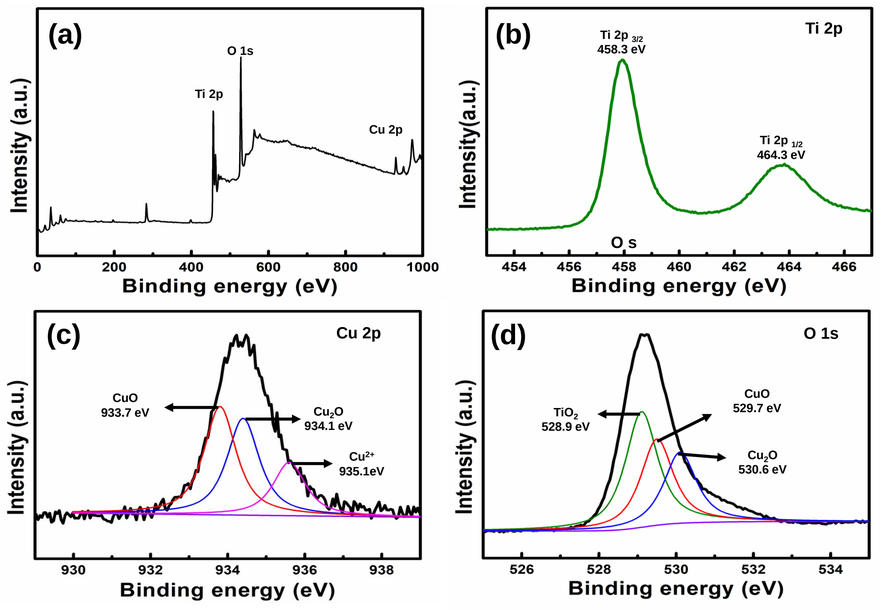


Fig10. Graph of TiO_2 coated with Copper oxides using XPS

Conclusion

1) TiO2 was synthesized with CuxO to reduce the band gap enough to always reduce the organic decomposition capability.
2) Using TAUC, XPS, and XRD analysis methods, We verified that the photocatalyst is well synthesized as intended.
3) Reuse experiments of Photocatalyst showed that performance is maintained well under ideal conditions.

Reference

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