MIC-Chroma

CERTIFICATE of Appreciation

This is to certify that

Dr. Leny Yuliati

contributed as

Oral Presenter

in Ma Chung International Conference on Chromatography

9 - 11 October 2017, Malang, Indonesia

Organized by:

UNIVERSITAS MA CHUNG

Ma Chung Research Center for Photosynthetic Pigments

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LETTER OF ASSIGNMENT

No: 309C/MACHUNG/ST/X/2017

The Rector of Universitas Ma Chung hereby assigns:

Name	:	Dr. Eng. Leny Yuliati, S.Si., M.Eng
Employee's Number	:	20160018
Position	:	Principal Investigator of MRCPP

to participate in the **Ma Chung International Conference on Chromatography (MIC-Chroma) as Oral Presenter** with abstract entitled **"Optimization of Reaction Conditions for Phenol Degradation over Platinum/Titanium Dioxide Photocatalyst"** hosted by MRCPP Universitas Ma Chung which is held on 9-11 Oktober 2017 in Ijen Suites Resort and Convention, Malang.

She has to submit an official report when returns to work.

Please be informed.

Malang, 9 October 2017

Rector

MA CHUNG

Dr. Chatief Kunjaya

Acknowledged by,

Ma Chung Research Center
for Photosynthetic Pigments

(Name)

CC:
1. Vice Rector
2. Ma Chung Research Center for Photosynthetic Pigments (MRCPP)
3. Human Resource Management

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Ma Chung Research Center
for Photosynthetic Pigments

MIC-Chroma

Ma Chung International Conference on Chromatography

Abstracts & Program

9 - 11 October 2017

Malang, Indonesia

In collaboration with :

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GENERAL SCHEDULE

Tuesday, 10 October 2017

Time	Ballroom	Classroom
08:00 - 09:15	Registration	
09:15 - 09:25	Opening remark	
09:25 - 10:15	Plenary lecture (PL-01): **Prof. Dr. Hian Kee Lee** *"Miniaturized and Green Sample Preparation Procedures in Combination with Chromatographic Analysis"* Moderator: Tatas H.P. Brotosudarmo, Ph.D.	
10:15 - 10:30	Coffee break	
10:30 - 11:05	Keynote lecture (KL-01): **Prof. Dr. Mohd Marsin Sanagi** "*Recent Advances in Solid Phase Microextraction Techniques towards Green Chemical Analysis*" Moderator: Dr. Leny Yuliati	
11:05 - 11:40	Keynote lecture (KL-02): **Assoc. Prof. Dr. Koichiro Awai, Ph.D.** "*Chromatography on Lipid Analysis: From Traditional Methods to Advanced Technologies*" Moderator: Dr. Hendrik Oktendy Lintang	
11:40 - 12:00	Group photo	
12:00 - 13:00	Lunch break	
13:00 - 14:30	Poster session	
14:30 - 14:55	Invited speaker (IS-01): **Dr. Zhaoqi Zhan** "*The Shimadzu MRM Method Package Tool For Rapid Method Development on LC/MS/MS for Various Applications*" Moderator: Dr. Hendrik Oktendy Lintang	Invited speaker (IS-02): **Wangsa Tirta Ismaya, Ph.D.** "*Development of HPLC Analysis of Protein Based Therapeutic Drug Product*" Moderator: Rehmadanta Sitepu, S.Farm, M.Si., Apt.

14:55 - 15:20	Invited speaker (IS-03): **Dr. rer.nat Rino R. Mukti** "*Recent Advances in the Syntheses of Zeolites and Their Emerging Applications*" Moderator: Dr. Yuyun Yuniati	Invited speaker (IS-04): **Tatas H.P. Brotosudarmo, Dipl.Chem., Ph.D., MRSC.** "*Analysis of Major Photosynthetic Pigment from Marine Brown Alga*" Moderator: Monika Prihastyanti, M.Nat.Sc.
15:20 - 15:35	Coffee break	
15:35 - 16:35	Oral presentation Moderator: 1. Dr. Hendrik Oktendy Lintang 2. Dr. Yuyun Yuniati	Oral presentation Moderator: 1. Rehmadanta Sitepu, S.Farm., M.Si., Apt. 2. Monika Prihastyanti, M.Nat.Sc.
18:00	Gala dinner	

Wednesday, 11 October 2017

Time	Ballroom	Classroom
08:00 - 09:00	Registration	
09:00 - 09:25	Invited speaker (IS-05): **Prof. Dr.rer.nat. Gunawan Indrayanto** "*Validation of Chromatographic Methods of Analysis: Application for Herbal Drugs*" Moderator: Dion Notario, S.Farm., M.Sc., Apt.	Invited speaker (IS-06): **Prof. Dr. Suppa Hannongbua** "*Determination of Absolute Configuration of Natural Products by Computational Approaches*" Moderator: Rokiy Alfanaar, S.Si., M.Si.
09:25 - 09:50	Invited speaker (IS-07): **Assoc. Prof. Dr. Chua Lee Suan** "*LC-MS/MS Based Phytochemical Profiling Integrated with Chemometrics for Quality Assurance of Herbal Plants*" Moderator: Ruth Febriana Kesuma, S.Si., M.Si.	Invited speaker (IS-08): **Assoc. Prof. Dr.Sc. Akhmad Sabaruddin, S.Si., M.Sc.** "*Development of Organic Polymer-based Monoliths: Application to Analytical and Bioanalytical Chemistry by Liquid Chromatography*" Moderator: Eva Monica, S.Farm., M.Sc., Apt.
09:50 - 10:05	Coffee break	

10:05 - 11:50	Oral presentation Moderator: 1. Dion Notario, S.Farm, M.Sc., Apt. 2. Ruth Febriana Kesuma, S.Si., M.Si.	Oral presentation Moderator: 1. Rokiy Alfanaar, S.Si., M.Si. 2. Eva Monica, S.Farm., M.Sc., Apt.
11:50 - 13:00	Lunch break	
13:00 - 14:15	Oral presentation Moderator: 1. Heriyanto, S.Si., M.Si., M.Sc. 2. Martanty Aditya, M.Farm-Klin., Apt.	Oral presentation Moderator: 1. Rollando, S.Farm., M.Sc., Apt. 2. Renny Indrawati, .S.TP., M.Nat.Sc.
14:15 - 14:30	Coffee break	
14:30 - 16:30	ABP session : **Prof. Dr. Reiko Motohashi** **Dr. Shin Usuki** Moderator: Tatas H.P. Brotosudarmo, Ph.D.	
16:30	Closing ceremony	

SCHEDULE OF ORAL PRESENTATIONS

Tuesday, 10 October 2017

Time	Ballroom	Classroom
15.35 – 15.50	**Faisal Hussin (OP-01)** *"Highly Efficient Zinc Oxide-Carbon Nitride Hybrid Photocatalysts for Degradation of Phenol under UV and Visible Light Irradiation"*	**Siti Maryam Jasman (OP-05)** *"Photocatalytic Oxidation of Nitrite Ion over Carbon Nitride"*
15:50 – 16:05	**Bactiar R.P. Ihsan (OP-02)** *"Validation Method HPLC for analysis Andrographolide in Ethyl Acetate Fractions of 70% Ethanol Extracts Andrographis paniculata"*	**Darius Greenidge (OP-06)** *"Investigations of Color Center Phenomena in Cinnabar and Metacinnabar through Electron Spin Resonance"*
16:05 – 16:20	**Nurul Istiqomah (OP-03)** *"Potential Fraction Cytotoxicity of Sisik Naga (Pyrrosia piloselloides [L.] M.G. Price.) Steril Fronds, Fertile Fronds, and Rhizome on Breast Cancer Cell T47D and Colon WiDr"*	**Suci Amalia (OP-07)** *"Preparation of Monolithic Nanobiocatalyst Microreactor for Fast Protein Digestion and Their Peptide Identification by Liquid Chromatography"*
16:20 – 16.35	**Moh. Mualliful Ilmi (OP-04)** *"Isothermal Adsorption Study of Congo Red Dye with ZSM-5 Directly Synthesized from Bangka Kaolin without Organic Template"*	**Renny Indrawati (OP-08)** *"Re-Evaluation on Multi-Chromatogram Approach of 3D-Chromatographic Data"*
Moderator	**1. Dr. Hendrik O. Lintang** **2. Dr. Yuyun Yuniati**	**1. Rehmadanta Sitepu, M.Si., Apt.** **2. Monika Prihastyanti, M.Nat.Sc.**

Wednesday, 11 October 2017

Time	Ballroom	Classroom
10:05 – 10:20	**Septi F. Raeni (OP-09)** *"Development of Ti^{4+}-Immobilized Nanoporous Monolithic Polymer for Selective Separation and Detection of Phosphopeptides"*	***Delianis Pringgenies (OP-17)*** *"Optimal Concentration of Magrove (Rhizopora Mucronata) Leaf and Propagule Based Natural Dye"*
10:20 – 10:35	**Nurul Husna Sabran (OP-10)** *"Significant Contribution of Copper(I) Pyrazolate Complex in Improving Activity of Anatase Titania"*	***Mohamad Azani Jalani (OP-18)*** *"Size-Exclusion Liquid Chromatography for Effective Purification of Amphiphilic Trinuclear Gold(I) Pyrazolate Complex"*
10:35 – 10:50	**Nurliana Ruslan (OP-11)** *"Gas Chromatography with Flame Ionization and Mass Spectrometer Detectors for Evaluation of Trimethylphenol Oxidation using Heterogeneous Catalyst Nanocomposite"*	***Mohd Hayrie Mohd Hatta (OP-19)*** *"Synthesis of Highly Active Crystalline Carbon Nitride Prepared in Various Salt Melts for Photocatalytic Degradation of Phenol"*
10:50 – 11:05	**Mohamad Rafi (OP-12)** *"Chromatographic Fingerprint Analysis for Quality Control of Medicinal Plant"*	***Agung Bagus Pambudi (OP-20)*** *"Direct Synthesis of ZSM-5 from Kaolin without Organic Template: Part 2. Effect of Type Seeding"*
11:05 – 11:20	**Yohanes Martono (OP-13)** *"Degradation Study Of Stevioside using*	***Florentinus D.O. Riswanto (OP-21)*** *"Analytical Method Validation and*

	HPLC and ESI-MS/MS"	*Determination of Daidzein and Genistein in Ethanolic Extract of Tempeh Using RP-HPLC"*
11:20 – 11:35	**Rahmat Budiarto (OP-14)** *"Gas Chromatography Mass Spectrometry to Profile Leaf Metabolites of Two Popular Citrus Rootstocks in Indonesia"*	***Edi Setiyono (OP-22)*** *"Identification of Carotenoids from Marine Bacterium Erythrobacter sp. KJ5 by Liquid Chromatography-Mass Spectrometry"*
11:35 – 11:50	**Leny Yuliati (OP-15)** *"Optimization of Reaction Condition for Phenol Degradation over Platinum/Titanium Dioxide Photocatalyst"*	***Bimo B. Santoso (OP-23)*** *"Two antimicrobial compounds drimane sesquiterpene polygodial and 11 Hydroxydrim-8-en-7-one from the stem bark of Drimys arfakensis Gibbs."*
11:50 – 12:05	**Hermin Pancasakti Kusumaningrum (OP-16)** *"Comparison of Patchouli Oil Quality from Several Place in Batang Region, Indonesia: Attempt in Improvement of Essensial Oil Quality using GC-MS Methods"*	***Mochammad Junus (OP-24)*** *"The Effect of Dairy Cattle Unit Sludge on the Nutrient of Rice Straw Composite"*
Moderator	1. Dion Notario, M.Sc.Apt. 2. Ruth Febriana Kesuma, S.Si., M.Si.	1. Rokiy Alfanaar, S.Si., M.Sc. 2. Eva Monica,S.Farm., M.Sc., Apt.

Wednesday, 11 October 2017

Time	Ballroom	Classroom
13:00 – 13:15	**Atiqa Rahmawati (OP-25)** *"Fermentation and Purification Study of Food Grade Bioethanol from Sugar Palm Sap (Arenga Pinnata)"*	**Sri Widarti (OP-30)** *"The Influence of Metal Ions; Calcium, Sodium and Copper in Activating a-Amylase with Respect to β-Cyclodextrin Grafted to Polystyrene−Diaminopropane as Stationary Phase in Affinity Chromatography"*
13:15 – 13:30	**Cheer Haan Lau (OP-26)** *"Influence of Concentrating Method on The Quality of Orthosiphon stamineus Extract"*	**Changi Wong (OP-31)** *"Screening of Bioactive compounds from Nepenthes ampullaria and Nepenthes rafflesiana"*
13:30 – 13:45	**Julius Pontoh (OP-27)** *"Gas Chromatographic Analysis of Fatty Acid Composition in the Fresh Water Fishes in North Sulawesi"*	**Rinaldi Idroes (OP-32)** *"The Effect of Column and Temperature Variation on the Determination of Dead Time in Chromatographic System using Mathematical Method"*
13:45 – 14.00	**Dewi Setyaningsih (OP-28)** *"Development and Validation of Thin Layer Chromatography Method for Estimation of Curcumin in Dissolution Samples Containing Mixture of Curcuminoids"*	**Randi Abdur Rohman (OP-33)** *"Role of Phenolic Acids as a Defense System in Oil Palm Infected by Ganoderma boninense"*
14:00 – 14:15	**Hendrik O. Lintang (OP-29)** *"Porous Kaolin-Phosphotungstic Acid Composites as Heterogeneous Catalyst for Friedel-Crafts Acylation of Anisole"*	**Rosita Dwi Chandra (OP-34)** *"Study on Pro-vitamin A and Metabolite Compounds Changes during Ripening Stages in Banana Agung Semeru (Musa paradisiaca formatypica)"*
Moderator	1. Heriyanto, S.Si., M.Si., M.Sc. 2. Martanty Aditya., M.Farm-Klin., Apt.	1. Rollando, S.Farm., M.Sc., Apt. 2. Renny Indrawati, S.TP., M.Nat.Sc.

OP-15

Optimization of Reaction Conditions for Phenol Degradation over Platinum/Titanium Dioxide Photocatalyst

Leny Yuliati[1-3]* and Herlin Noorain Danuri[4]

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[2]*Department of Chemistry, Faculty of Science and Technology, Universitas Ma Chung, Malang 65151, East Java, Indonesia*
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[4]*Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia*

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Keywords: phenol, photocatalyst, platinum, titanium dioxide

Titanium oxide (TiO_2) is widely used as a photocatalyst for degradation of organic pollutants such as phenol. In order to improve the photocatalytic efficiency of TiO_2, modification and reaction condition optimizations were carried out in this study. Three types of TiO_2 with different crystal structures were investigated, which were anatase, rutile, and mixture of anatase and rutile. It was confirmed that the anatase phase structure gave a higher photocatalytic activity than other TiO_2 phases for phenol degradation after two hours of reactions under UV light irradiation. Modification of anatase TiO_2 was conducted by the addition of Platinum (Pt) as a co-catalyst by impregnation method, followed by calcination under the flow of hydrogen. The Pt/TiO_2 series was then characterized by X-ray diffraction (XRD), particle size analyser, diffuse reflectance UV-Visible (DR UV-Visible) and fluorescence spectroscopies. The results of the phenol degradation were analyzed by a gas chromatography equipped with a flame ionization detector (GC FID, Shimadzu 2014). The effect of Pt co-catalyst loading on TiO_2 anatase was investigated and it was confirmed that 0.5 wt% loading on TiO_2 gave the highest photocatalytic phenol degradation. The presence of Pt with an optimum amount was found to decrease the electron-hole recombination on the TiO_2, which led to the improved activity. Optimization of the reaction conditions was performed by varying the amount of catalyst, pH of the solution, and addition of hydrogen peroxide into the phenol solution. It was observed that the optimized conditions for the Pt/TiO_2 to give the best activity was obtained when using 50 mg of catalyst, phenol solution pH of 6.4 and ratio of hydrogen peroxide to phenol solution of 10.5. The kinetic study showed that the reactions followed the first order reaction and the rate of reaction increased with the addition of hydrogen peroxide under the optimized conditions.

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OPTIMIZATION OF REACTION CONDITIONS FOR PHENOL DEGRADATION OVER PLATINUM/TITANIUM DIOXIDE PHOTOCATALYST

Leny Yuliati
Herlin Noorain Danuri

KERANA TUHAN UNTUK MANUSIA
UNIVERSITI TEKNOLOGI MALAYSIA

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INTRODUCTION (1)

Phenol

Phenol is a toxic organic pollutants because it can harm the environment and living creatures.

Various methods have been used to treat phenol, such as:

- adsorption method on activated carbon[1]
  Disadvantage: high cost and poor mechanical strength.
- biological method, such as on bacterial strain *Cupriavidus metallidurans*[2]
  Disadvantage: need the accelerators and suitable bacterial cell
- chemical method by catalytic wet air oxidation (CWAO)[3]
  Disadvantage: need heating and strong oxidation agents.

PHOTOCATALYTIC REACTIONS

[1] Ozkaya, *Journal of Hazardous Materials*, **129** (2006), 158-163
[2] Stehlickova *et al.*, *International Biodeterioration & Biodegradation*, **63** (2009), 923-927
[3] Lin *et al.*, *Water Research*, **36** (2002), 3009-3014

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INTRODUCTION (2)

Photocatalytic Reactions

- ✓ Promote complete oxidation of phenol to CO_2 and H_2O.[1,2]
- ✓ Work at very low concentration.[2]
- ✓ Has large capability for the water treatment and provides environmental friendly process.[2]
- ✓ Uses light as a source of energy, metal oxides as the semiconductor photocatalysts and mild oxidizing agent such as oxygen and air.[1,2]

1) Kavita, V. and Palanivelu, K. *Chemosphere*, **55** (2004), 1235-1243
2) Al-Rasheed, R.A. *4th SWCC Acquired Experience Symposium*. (2005) Jeddah

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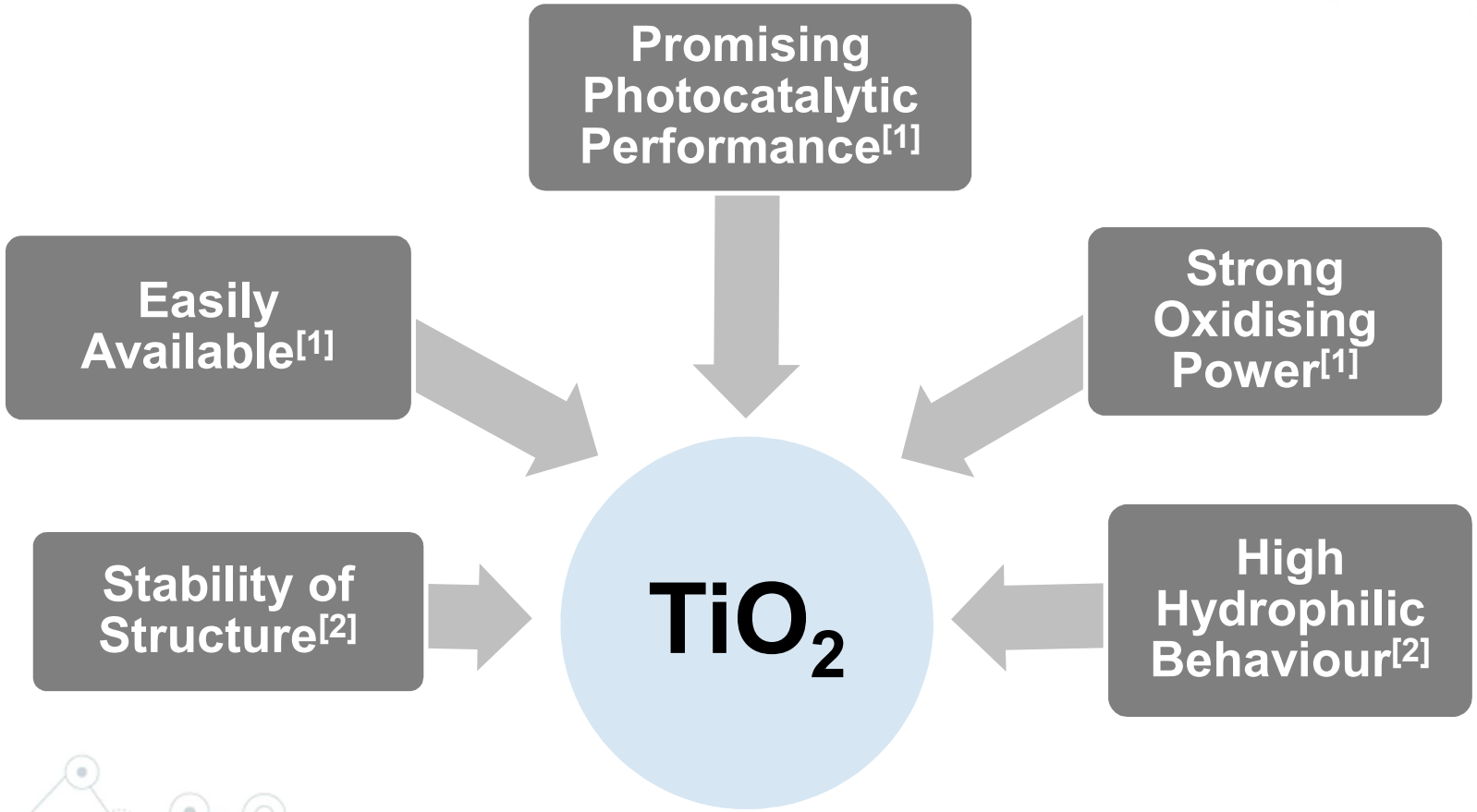
INTRODUCTION (3)

Advantages of TiO_2 Photocatalyst



[1] Wang *et al.*, 2002, *Surface and Coatings Tech.*, **155**, 141-145.
[2] Lee *et al.*, 2008, *Mat. Chem. and Phys.*, **109**, 275-280.

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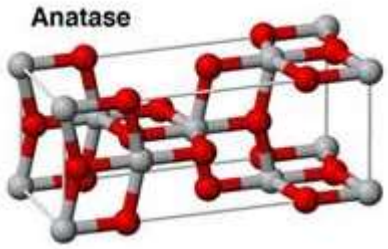
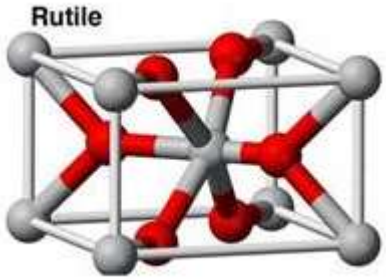
INTRODUCTION (4)

Drawbacks of TiO_2 Photocatalyst





High Rate of Electron-Hole Recombination

↓

Short Lifetime of Charge Separation

↓

Low Quantum Yield and Poor Efficiency of Photocatalyst

Zhang, *et al.*, 2010, *Transition Met. Chem.*, **35**, 933-938.

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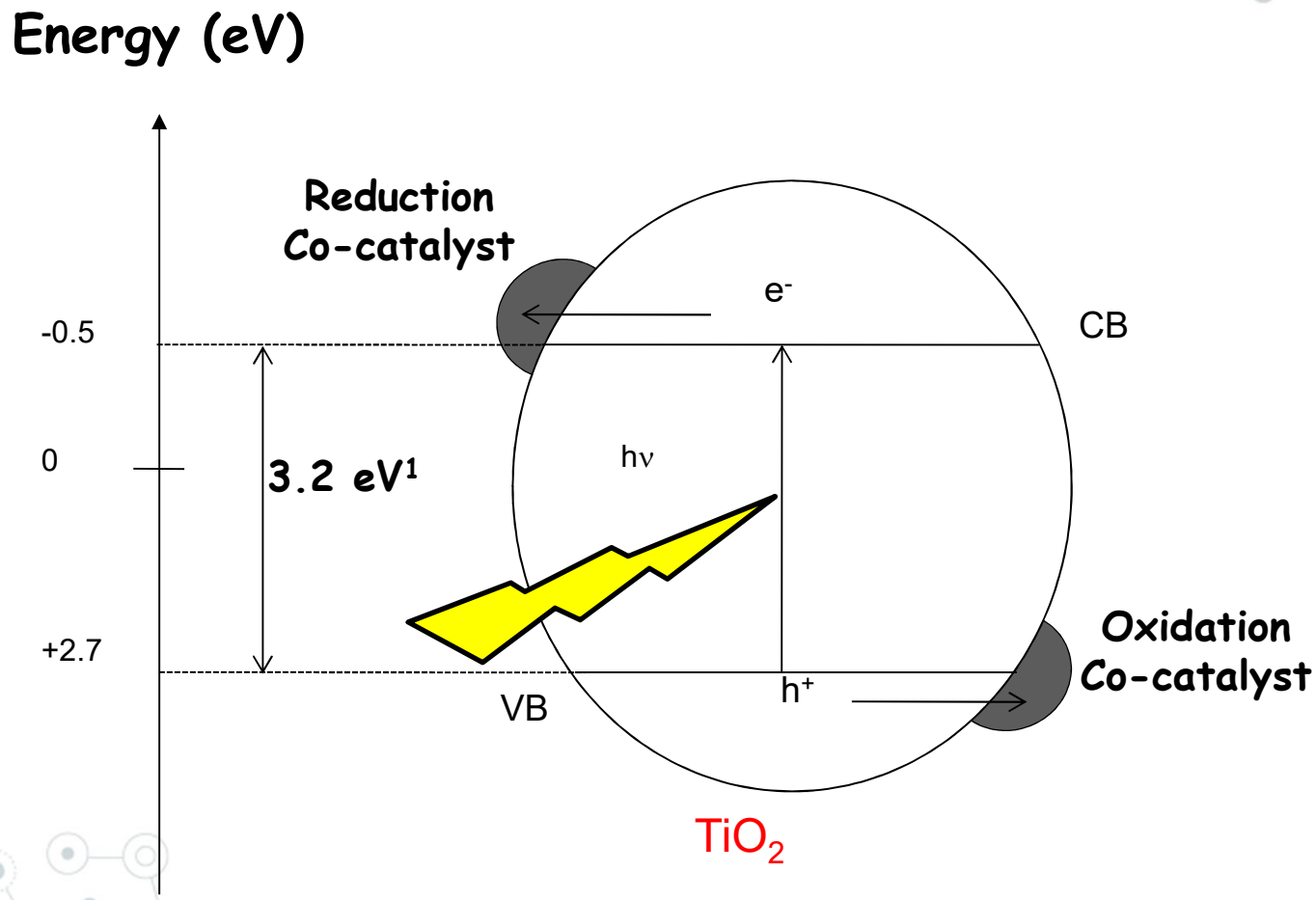
INTRODUCTION (5)

Modification of TiO_2 Photocatalyst with Co-catalyst



Vilela *et al*., *Energy and Environmental Science*, **5** (2012), 7819-7832

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EXPERIMENTAL METHODS (1)

Preparation of Pt/TiO_2

$H_2PtCl_6 \cdot 6H_2O$

- Immersion in H_2O, ultrasonication for 15 mins
- Addition of TiO_2
- Stirring and heating at 80-90 ºC (until dry)
- Reduction of Pt with condition:

  H_2 flow = 30 mL/min
  Temperature = 200 ºC
  Time = 30 minutes

$Pt(x)/TiO_2$

x = 0.1, 0.5 and 1.0 wt%

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EXPERIMENTAL METHODS (2)

Catalyst Characterizations

X-ray diffraction (XRD)	To confirm the phase composition of the catalysts
Particle size analyzer	To determine the particle size distribution of the catalysts
DR UV-Vis spectroscopy	To confirm the absorption band of the catalysts
Fluorescence spectroscopy	To determine the excitation and emission spectra of the catalysts

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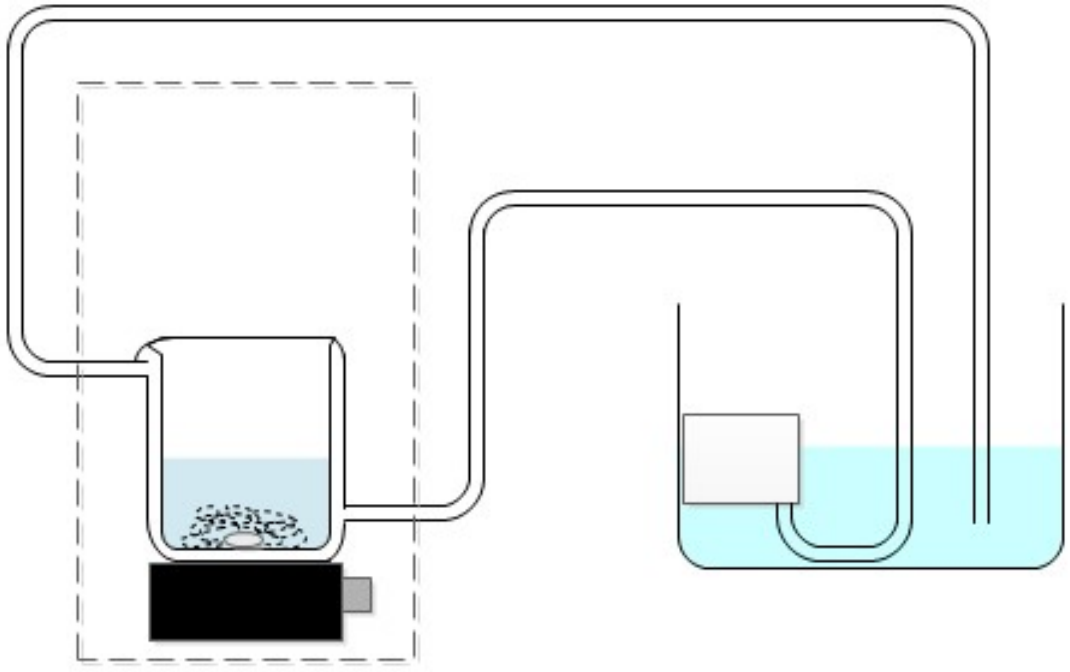
EXPERIMENTAL METHODS (3)

Photocatalytic Reactions

Open reactor photocatalytic system attached with a water cooling system

Phenol (50 ppm, 50 mL) + Variation (catalyst loading, pH, addition H_2O_2



Photocatalytic Activity Test

- Stirred for 1 hour in dark condition (reaching equilibrium)
- Exposed to UV irradiation over 2 hours at room temperature

Products Analysis

- Filtered from catalyst
- Measured by GC-FID

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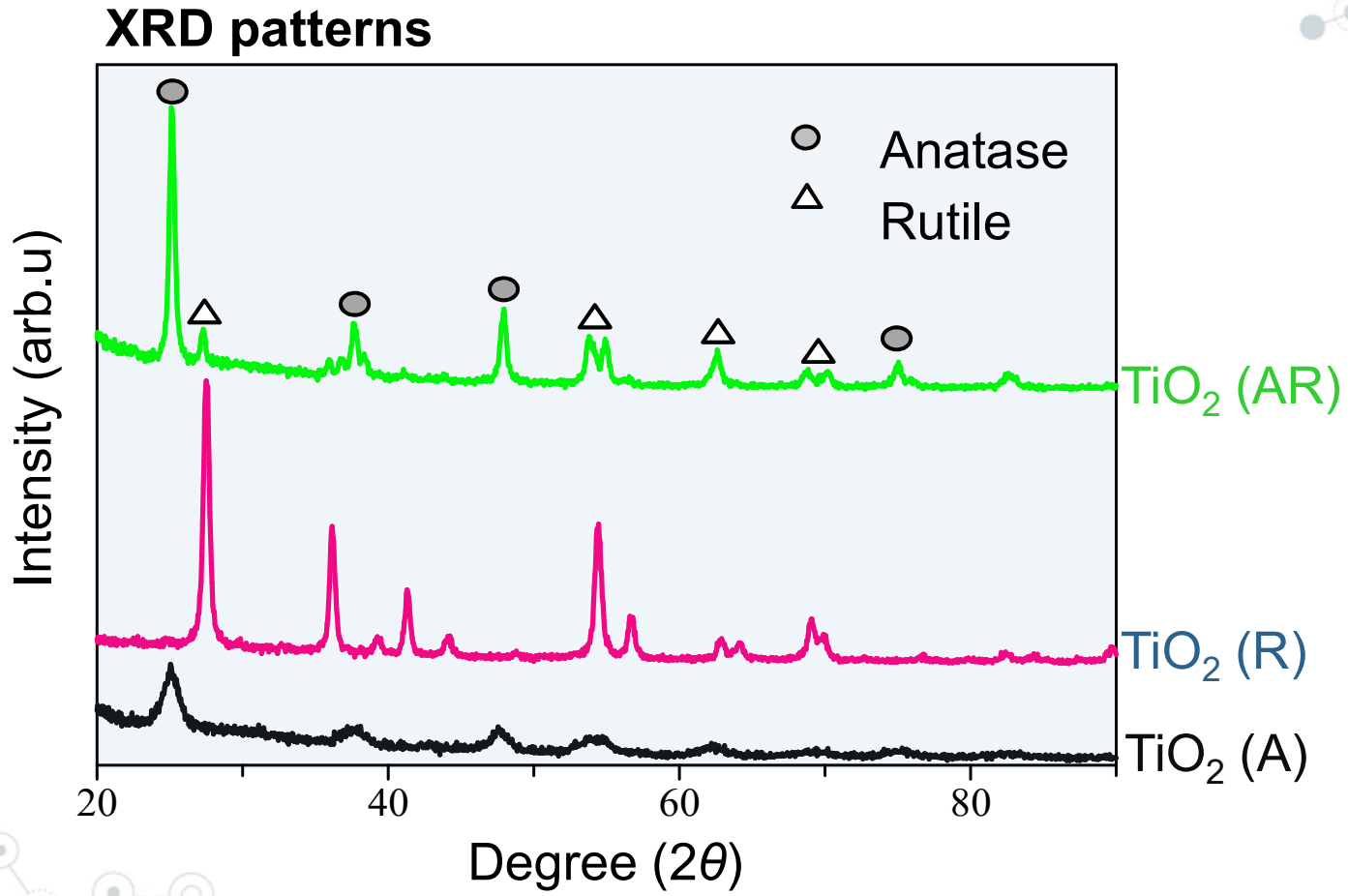
RESULTS AND DISCUSSION (1)

Phase Composition of TiO_2



Diffraction peak intensity of TiO_2 (A) is much lower than TiO_2 (R) and TiO_2 (AR)- due to lower crystallite size and/ or lower crystallinity.

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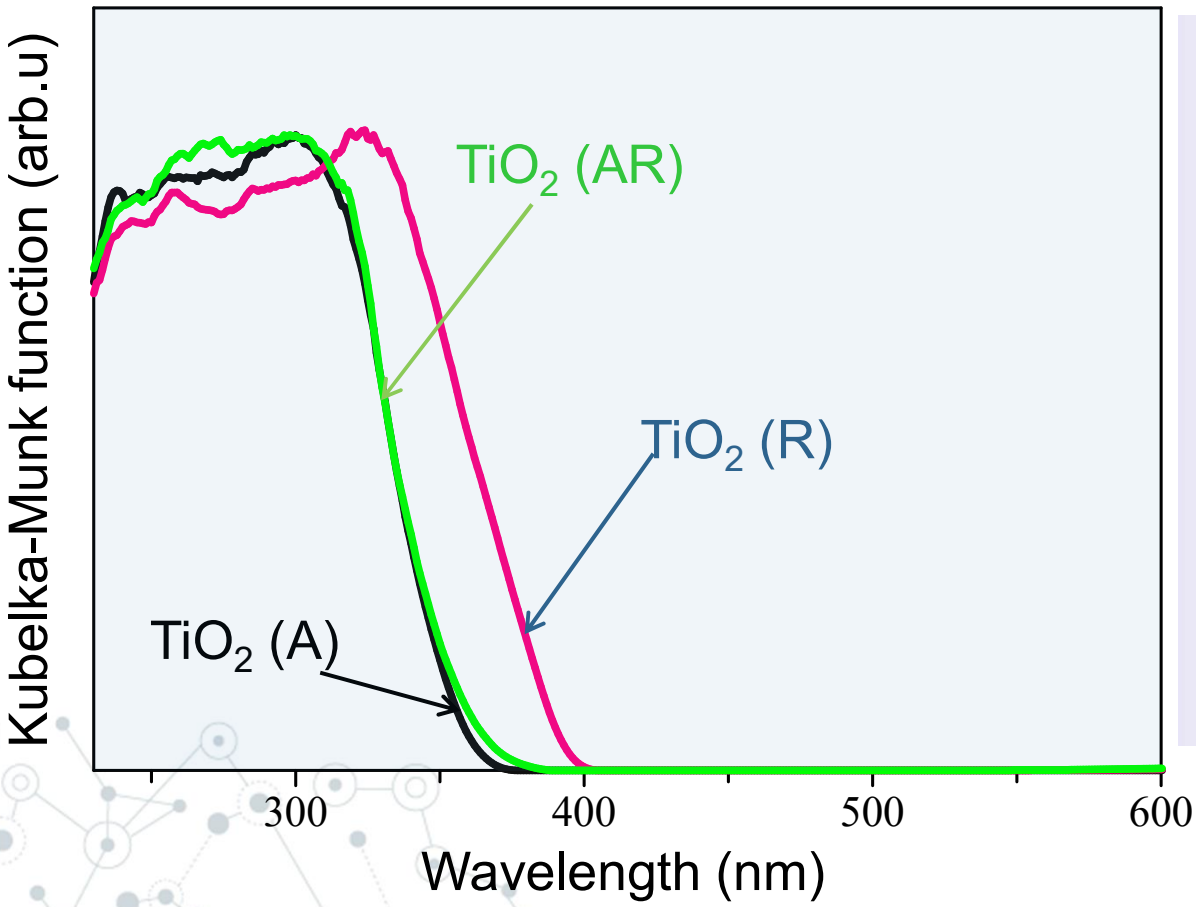
RESULTS AND DISCUSSION (2)

Optical Properties of TiO_2

DR UV-Vis spectra



- All the TiO_2 samples absorbed UV region only.
- TiO_2 (A) and TiO_2 (R) showed maximum absorption peak at 320 nm and 340 nm, respectively.
- TiO_2 (AR) showed maximum absorption peak similar to TiO_2 (A).

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RESULTS AND DISCUSSION (3)

Photocatalytic Activity

Catalyst	Percentage of removal (%)
TiO_2 (A)	**22**
TiO_2 (AR)	8
TiO_2 (R)	0
Pt(*0.1*)/TiO_2 (A)	11
Pt(*0.5*)/TiO_2 (A)	**28**
Pt(*1.0*)/TiO_2 (A)	10

Reaction Conditions:

Reaction time : 2 hours
Lamp used : UV light
Catalyst loading : 50 mg
pH : 6.4

- TiO_2 (A) showed the highest percentage removal of phenol than that of TiO_2 (AR) and TiO_2 (R).
- Pt showed its potential as a good co-catalyst in the TiO_2 photocatalyst system. The highest activity was observed on **Pt(*0.5*)/TiO_2 (A)**.

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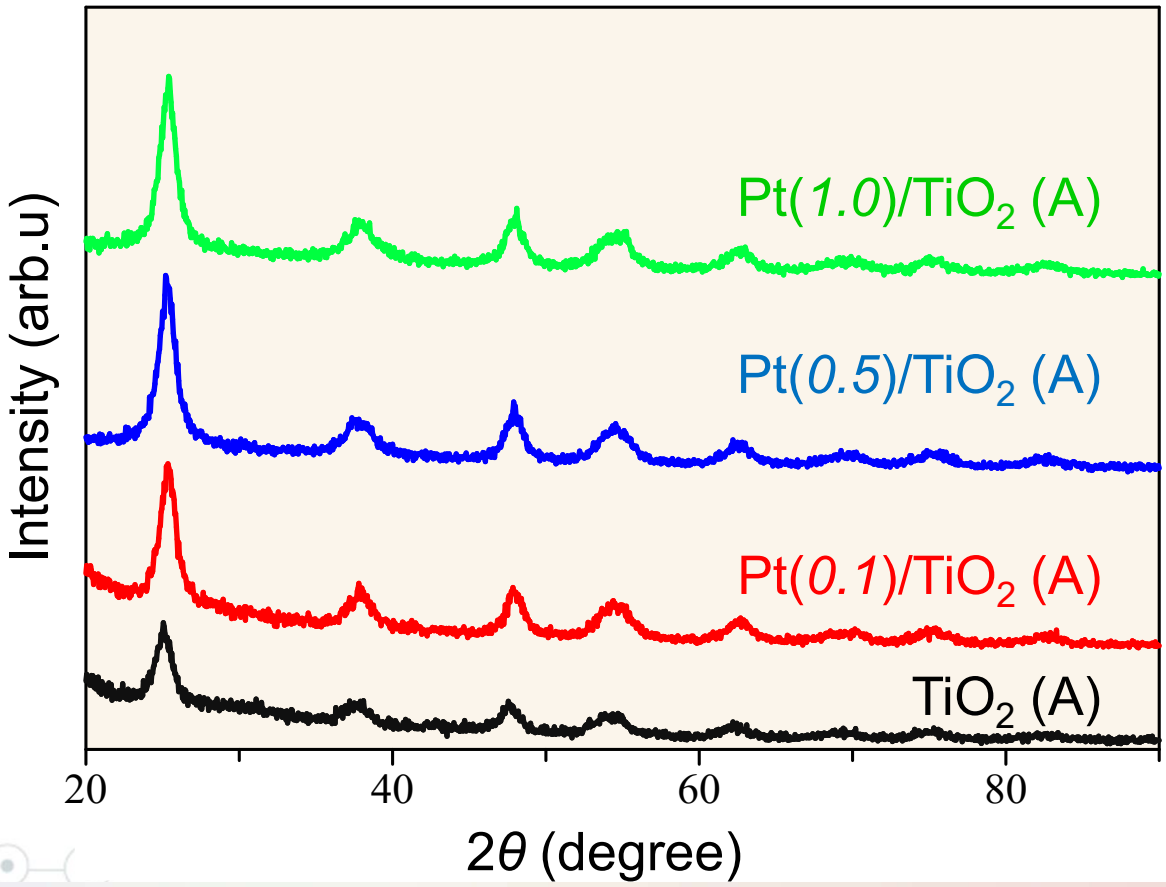
RESULTS AND DISCUSSION (4)

Effect of Pt Loading on Structural Properties

XRD patterns



The addition of Pt might induce the high crystallinity or increase the crystallite size of the TiO_2(A).

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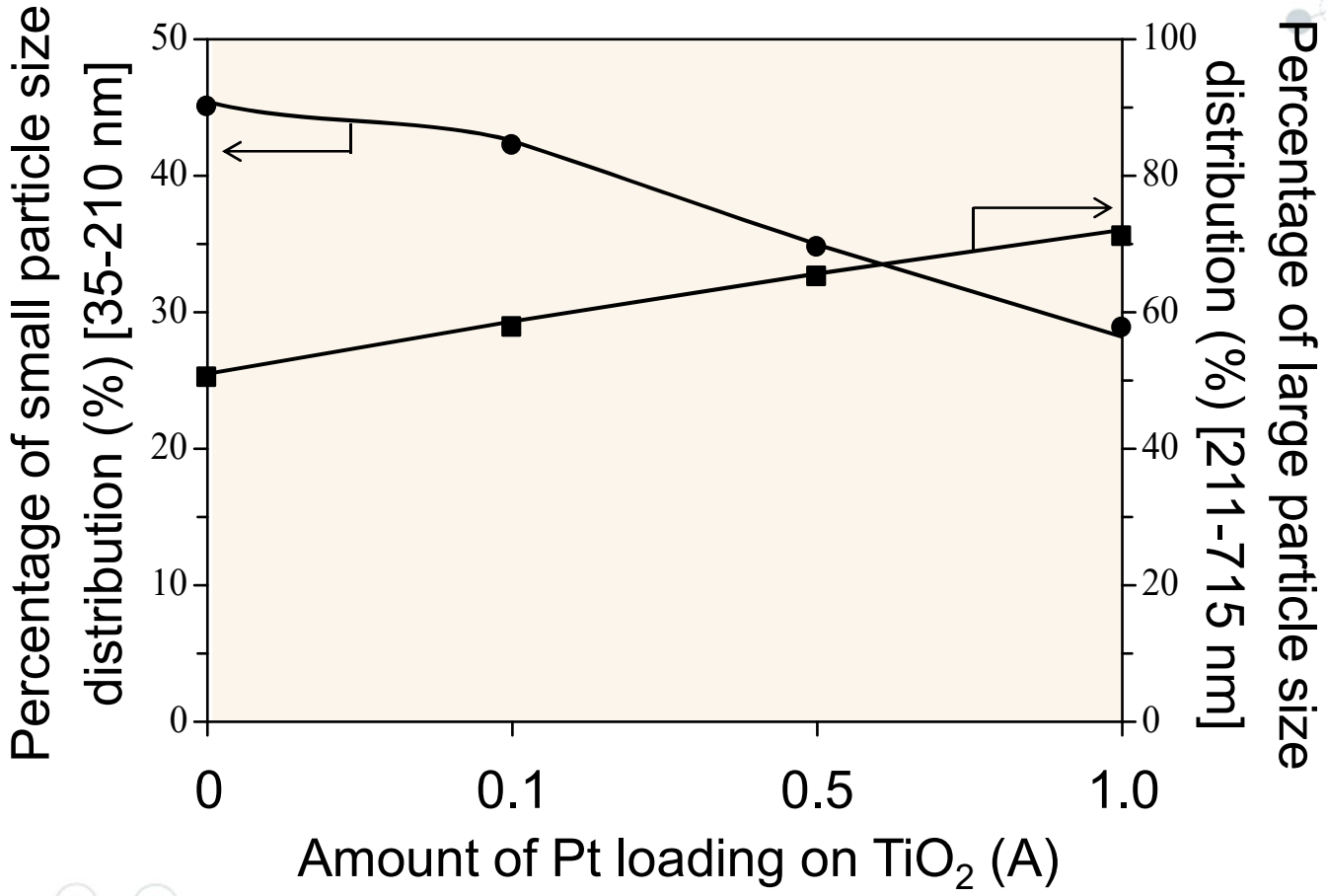
RESULTS AND DISCUSSION (5)

Effect of Pt Loading on Particle Size Distribution



The percentage of small particle size distribution decreased while the large particle size distribution increased with the increase of Pt loading amount.

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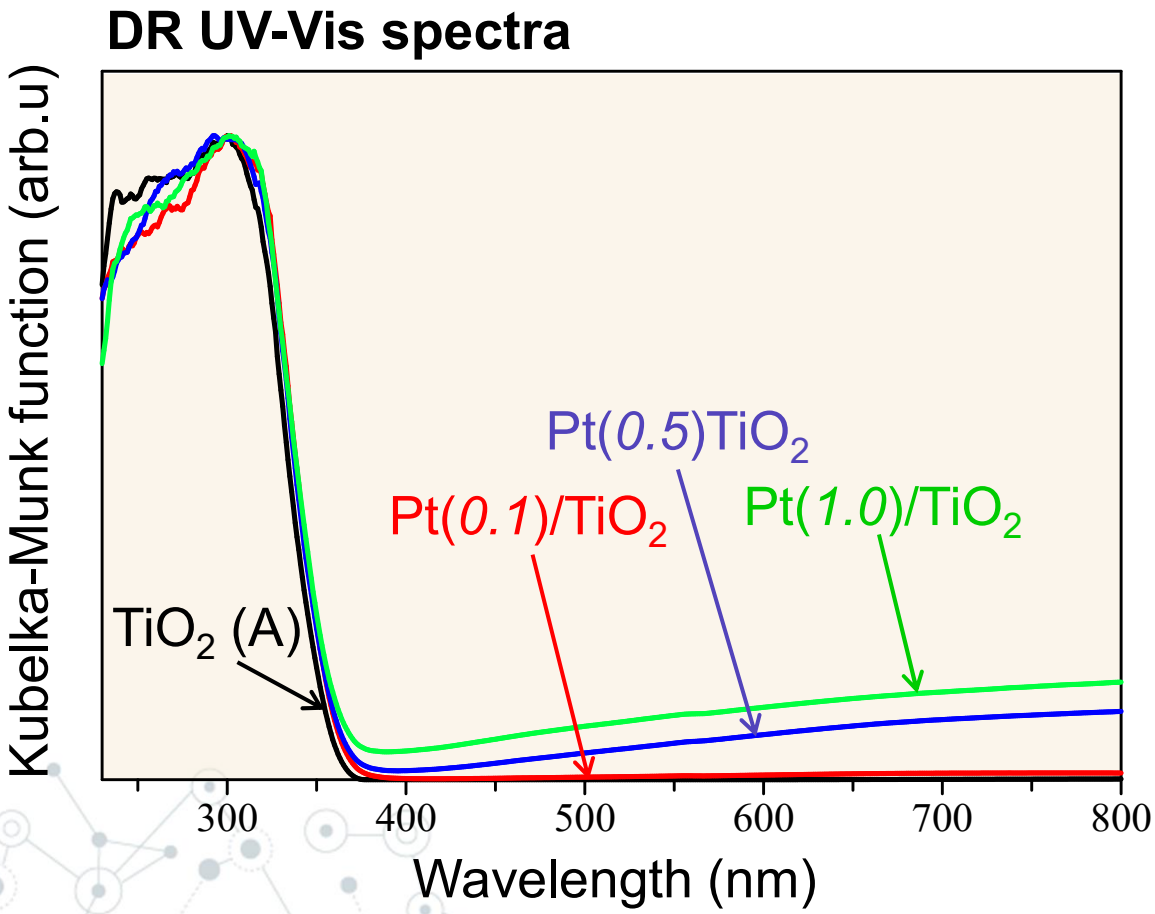
RESULTS AND DISCUSSION (6)

Effect of Pt Loading on Optical Properties



- Addition of Pt resulted in a little shifting in the absorption edge of TiO_2.
- Various Pt content showed extended absorption into the wavelength of visible region, suggesting the presence of Pt on the surface of TiO_2(A).

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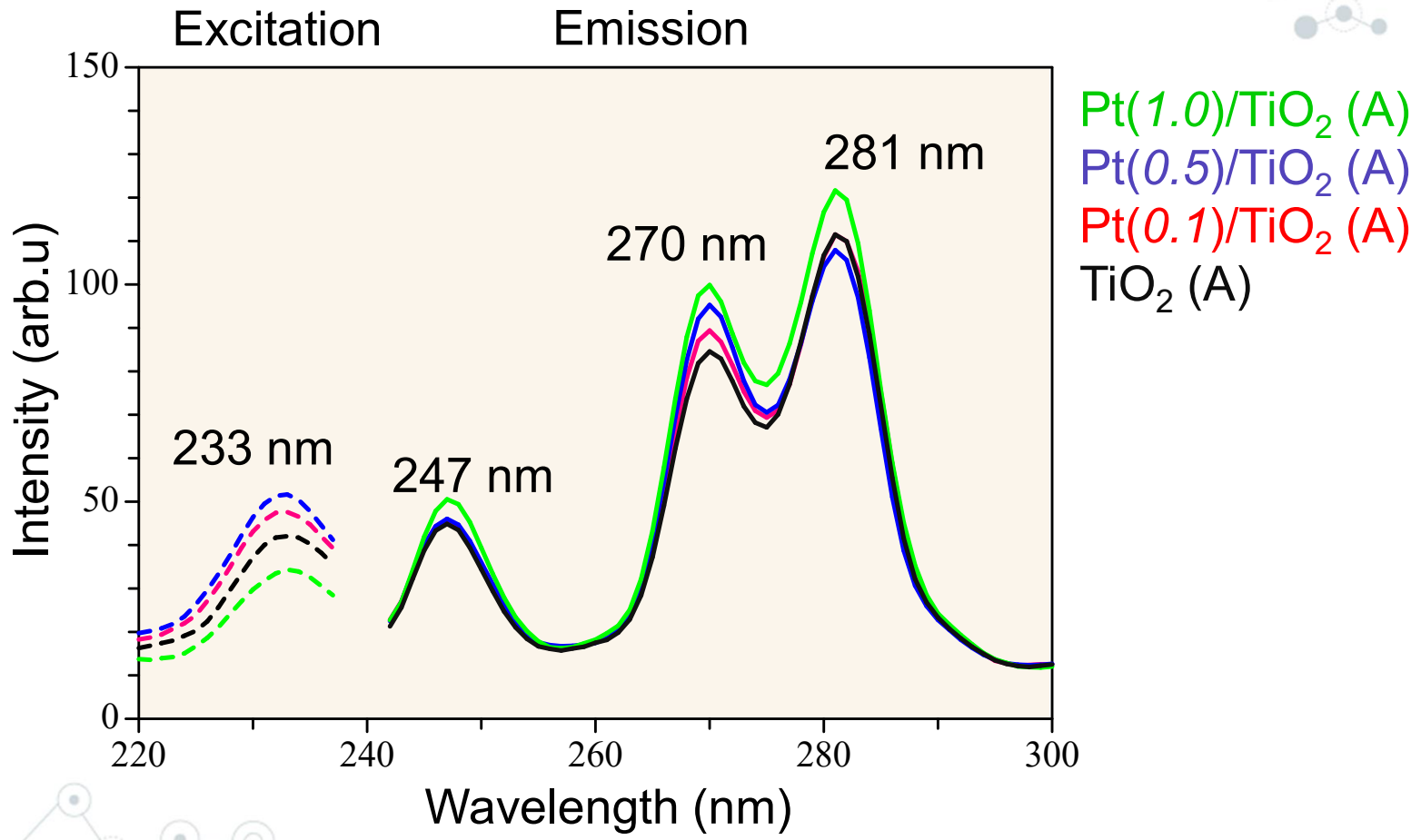
RESULTS AND DISCUSSION (7)

Effect of Pt Loading on Fluorescence Properties



- Pt(*0.5*)/TiO_2(A) showed the lowest emission intensity, suggesting the lowest electron-hole recombination, which led to highest activity.

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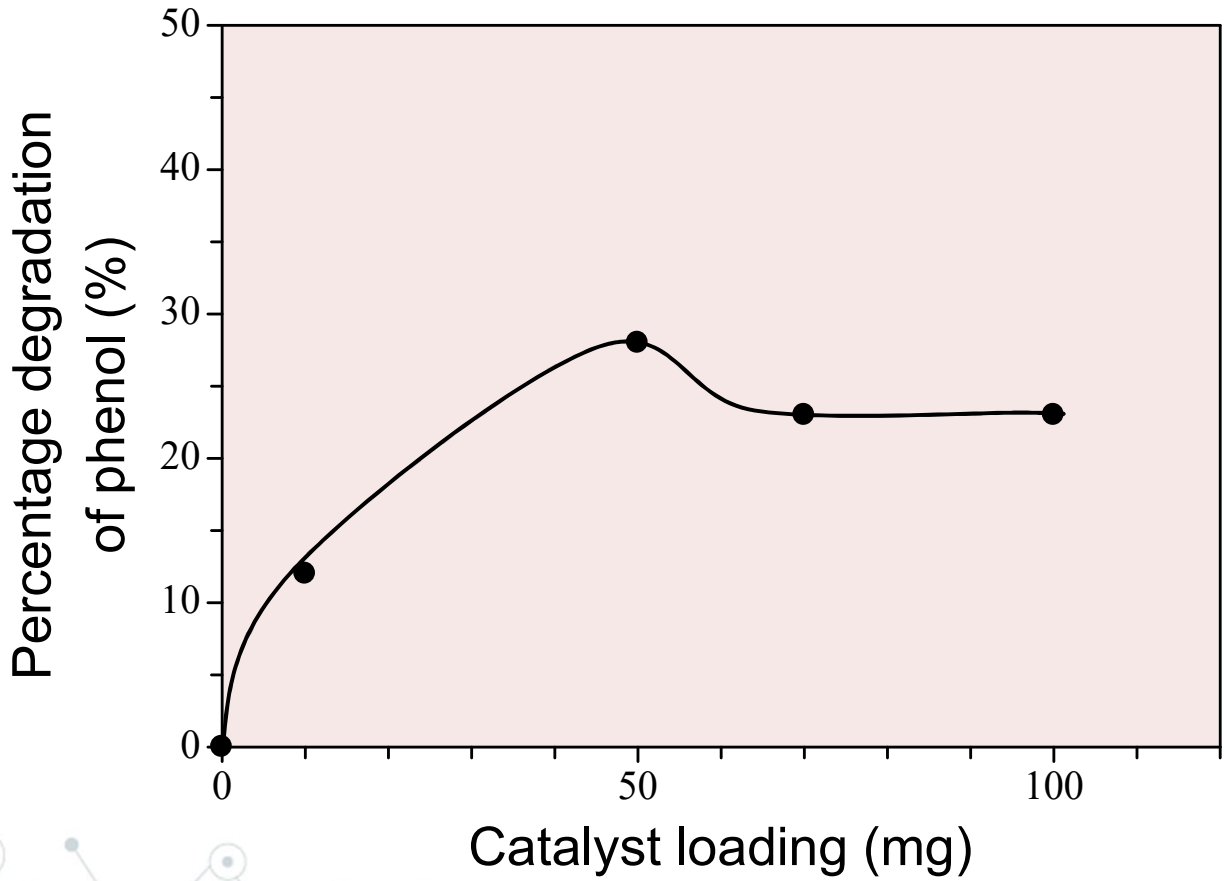
RESULTS AND DISCUSSION (8)

Effect of Catalyst Loading Amount



Reaction Conditions:

Reaction time : 2 hours
Lamp used : UV light
pH : 6.4

On Pt(*0.5*)/TiO_2(A), the optimum amount of catalyst loading was 50 mg.

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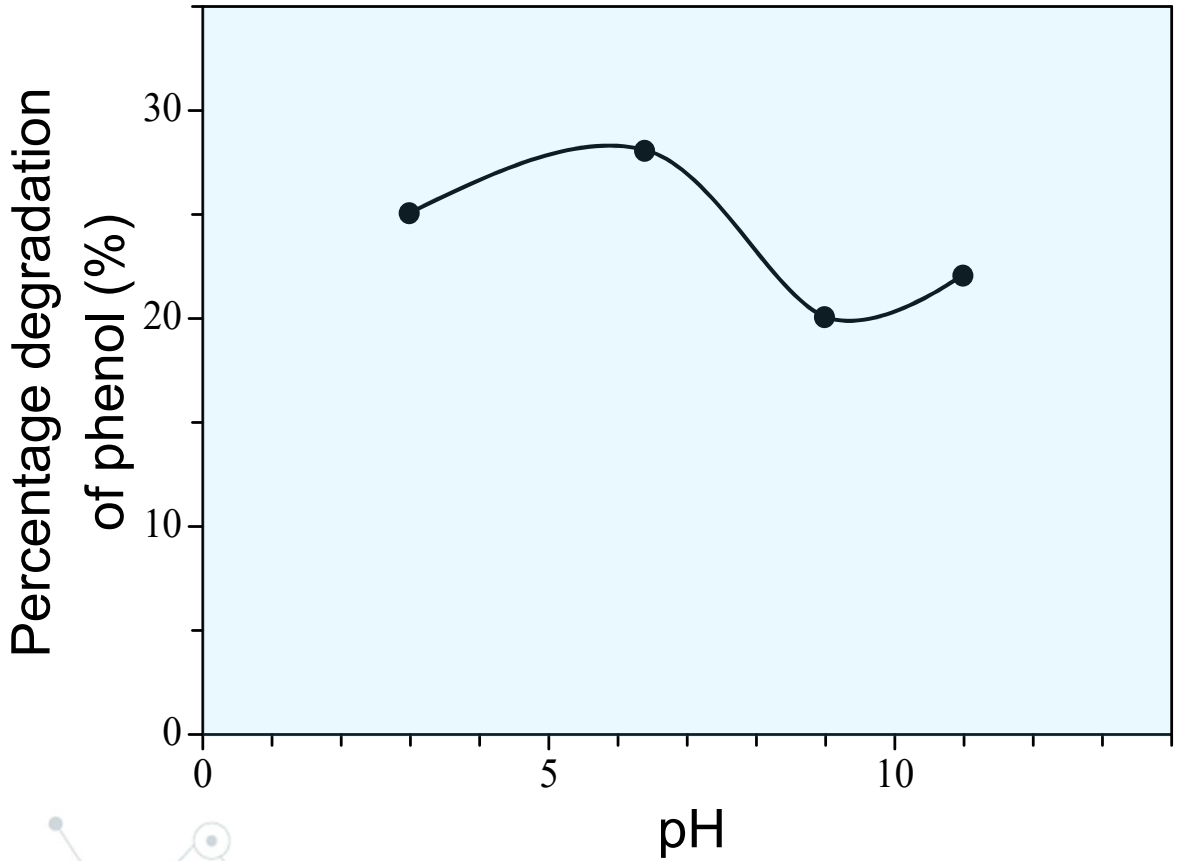
RESULTS AND DISCUSSION (9)

Effect of Solution pH



Reaction Conditions:

Reaction time : 2 hours
Lamp used : UV light
Catalyst : 50 mg

On Pt(*0.5*)/TiO_2(A), the optimum solution pH was 6.4.

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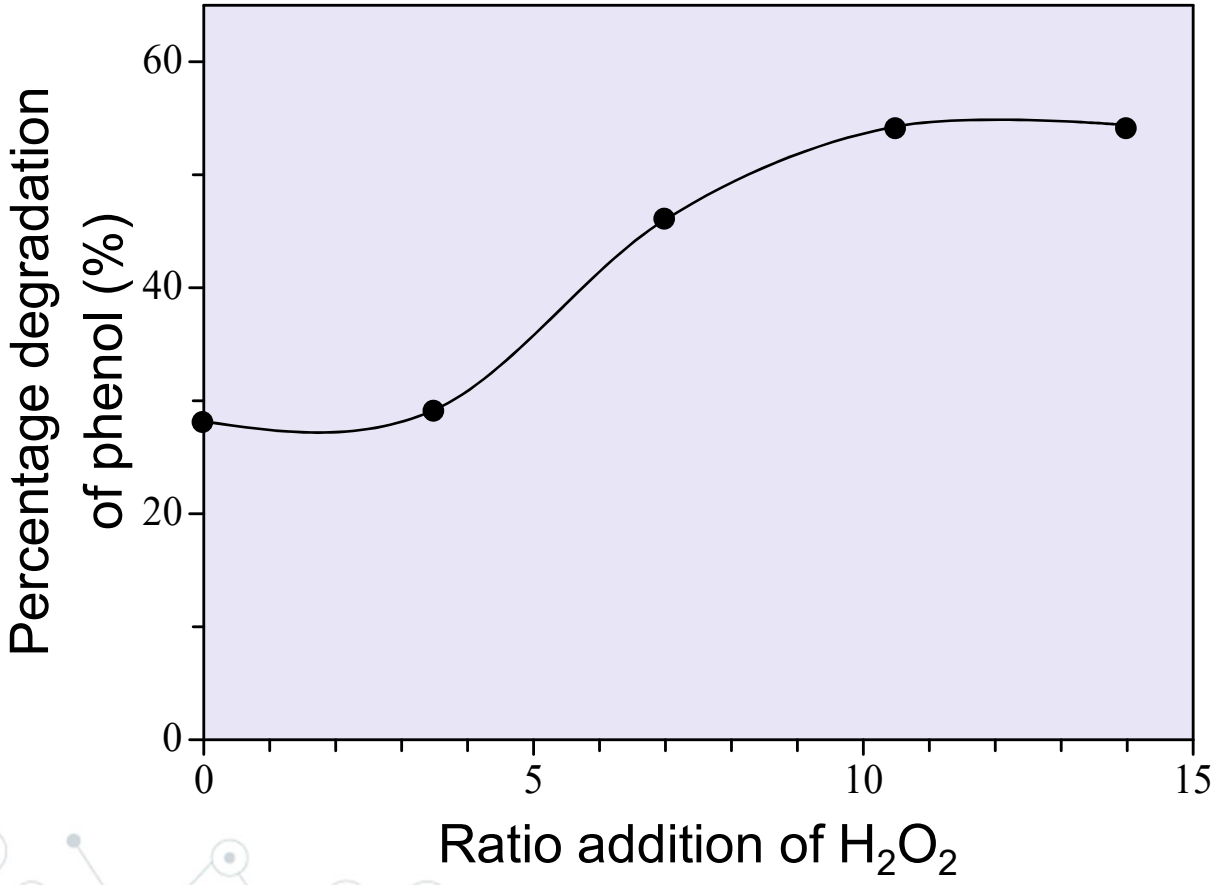
RESULTS AND DISCUSSION (10)

Effect of H_2O_2 Addition



Reaction Conditions:

Reaction time	: 2 hours
Lamp used	: UV light
Catalyst	: 50 mg
pH	: 6.4

On Pt(*0.5*)/TiO_2(A), the optimum ratio of addition H_2O_2 to phenol solution was 10.5.

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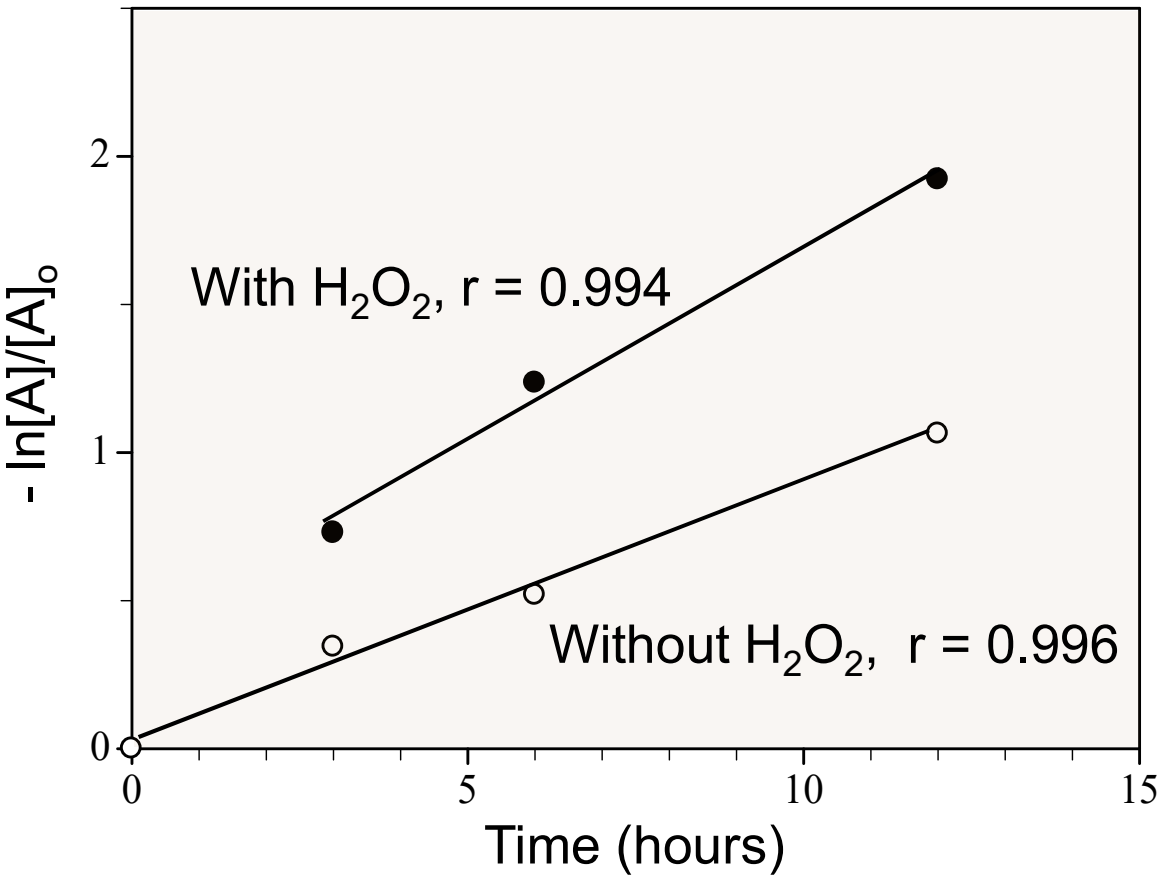
RESULTS AND DISCUSSION (11)

Kinetic Study



- The reactions are followed the first order kinetic.
- The constant rate of reaction increased with the addition of H_2O_2 under optimized conditions.

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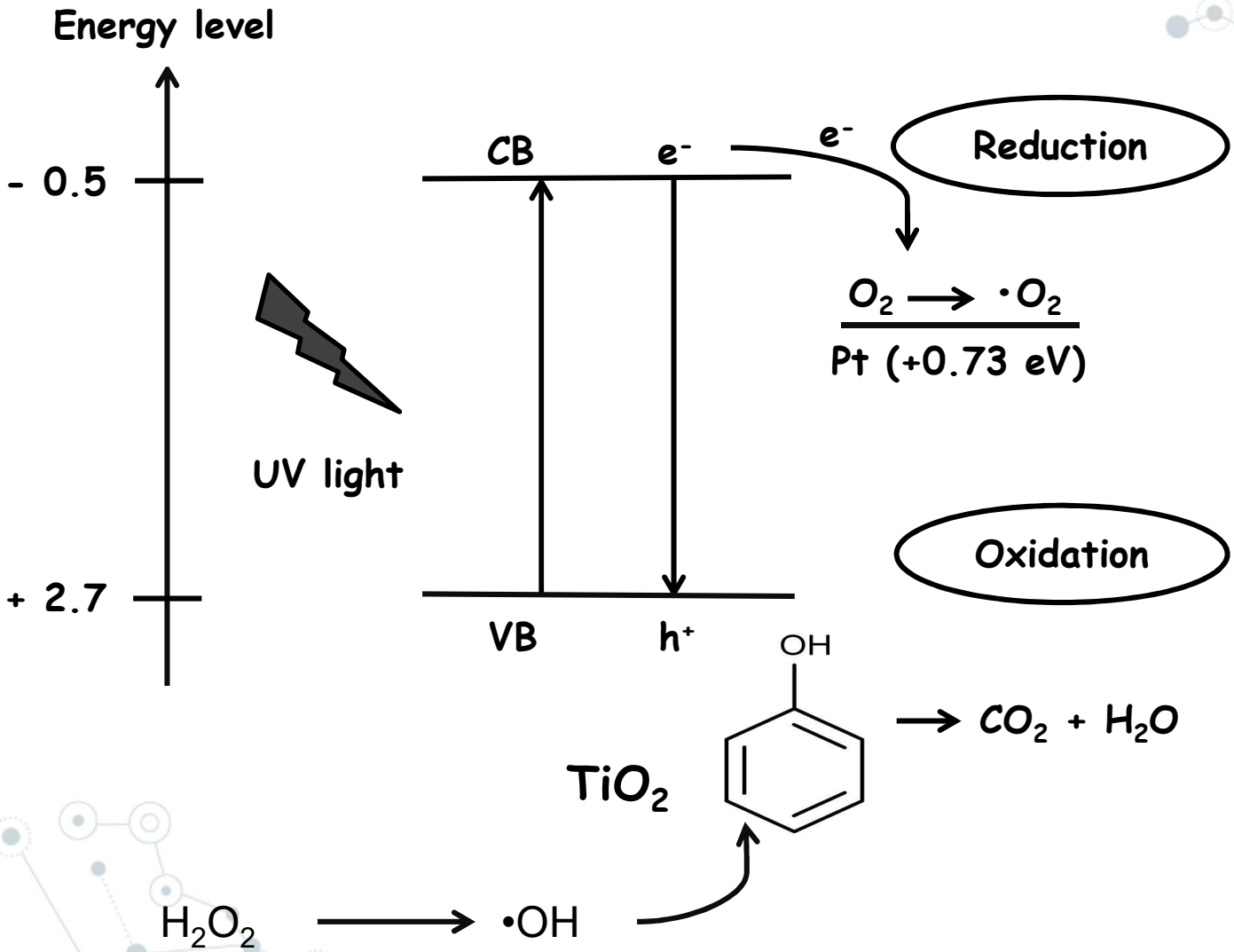
RESULTS AND DISCUSSION (12)

Proposed Mechanism



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CONCLUSIONS

1. Pt showed its potential as a good co-catalyst in the TiO_2 photocatalyst system.

2. The most appropriate condition for the Pt/TiO_2 to give the highest activity (54%) was obtained when using 50 mg of catalyst, phenol solution pH of 6.4 and ratio of H_2O_2 to phenol solution of 10.5.

3. The kinetic study showed that the reactions followed first order reaction and the rate of reaction increased with the addition of H_2O_2 under optimized conditions.

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