JASTIP Program

Kyoto University - King Mongkut's Institute of Technology Ladkrabang

Development of New Functional Materials for Energy and Environment

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Development of New Functional Materials for Energy and Environment

Japan Team

Head:
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Thai Team

Head:
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Thai Research Team

King Mongkut's Institute of Technology Ladkrabang (KMITL)

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RGJ Ph.D student collaborated with Prof. Ishihara

Rajamangala University of Technology Thanyaburi (RMUTT)

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Dr. Athapon Simpraditpan

National Science and Technology Developmment Agency (NSTDA)

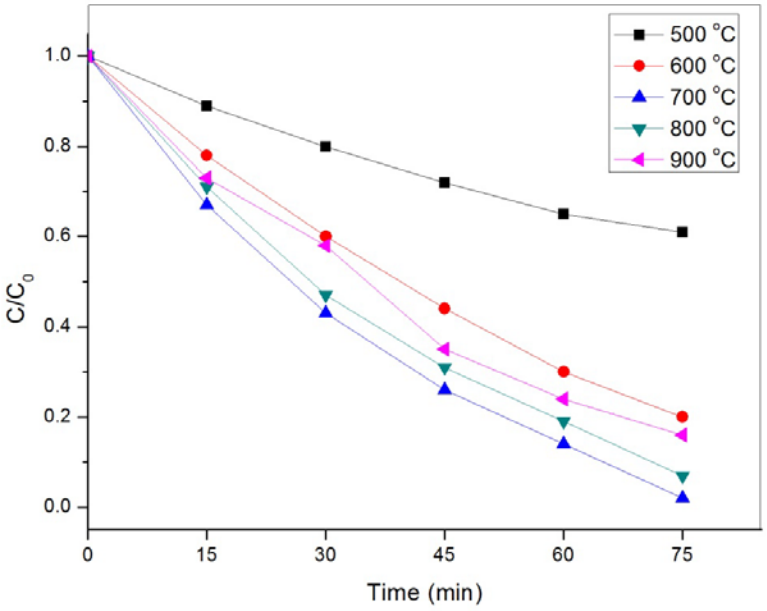
Dr. Anucha Wannnagon

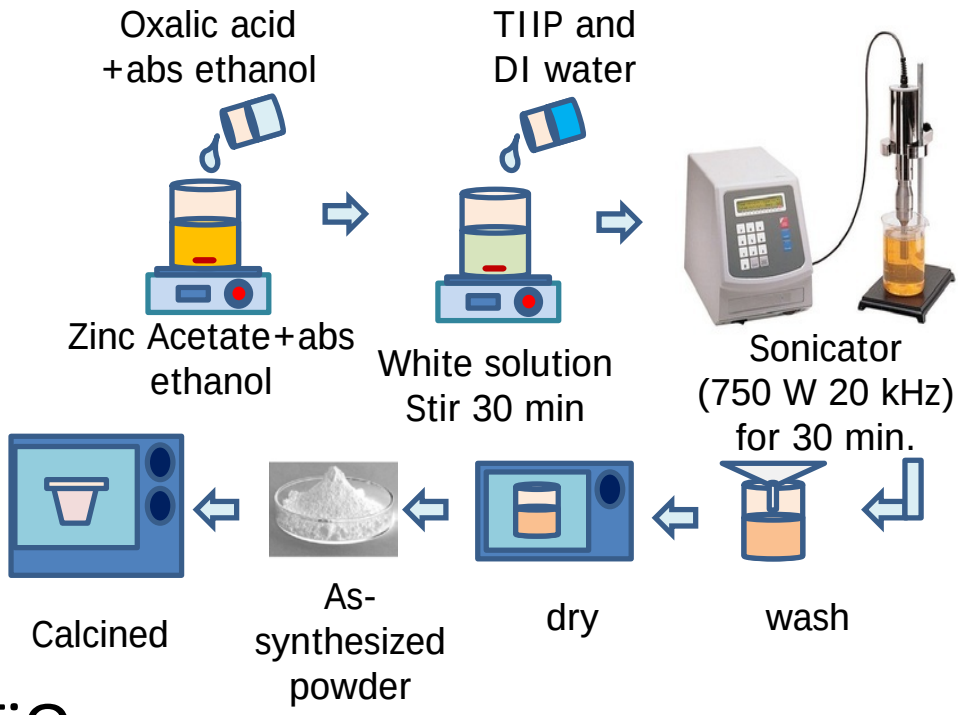
Dr. Samunya Saguanpak

Researches Background

Base Technology 1 (KMITL)

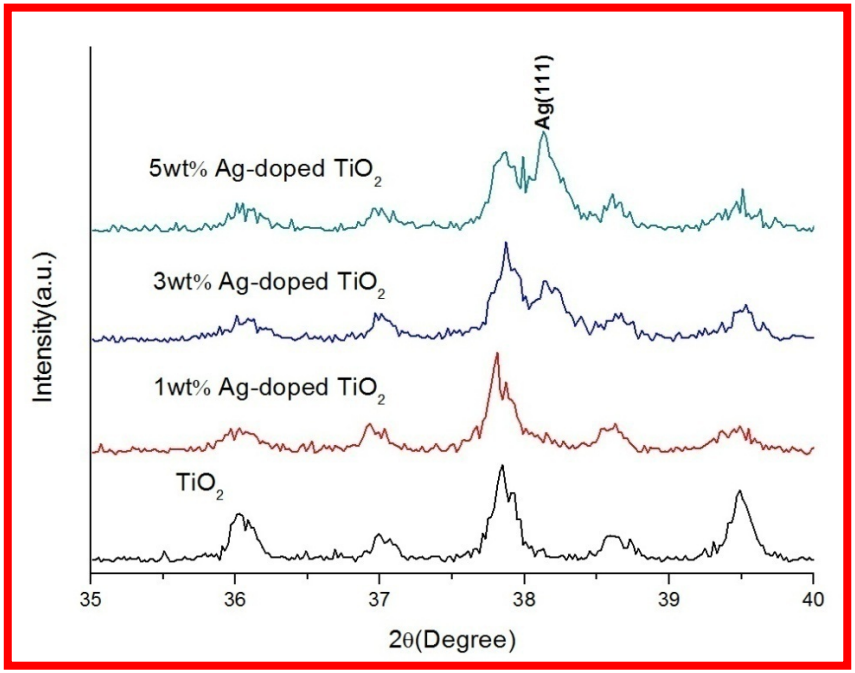
- Synthesis of Photocatalysts by Sono-chemical process and mechano-chemical method

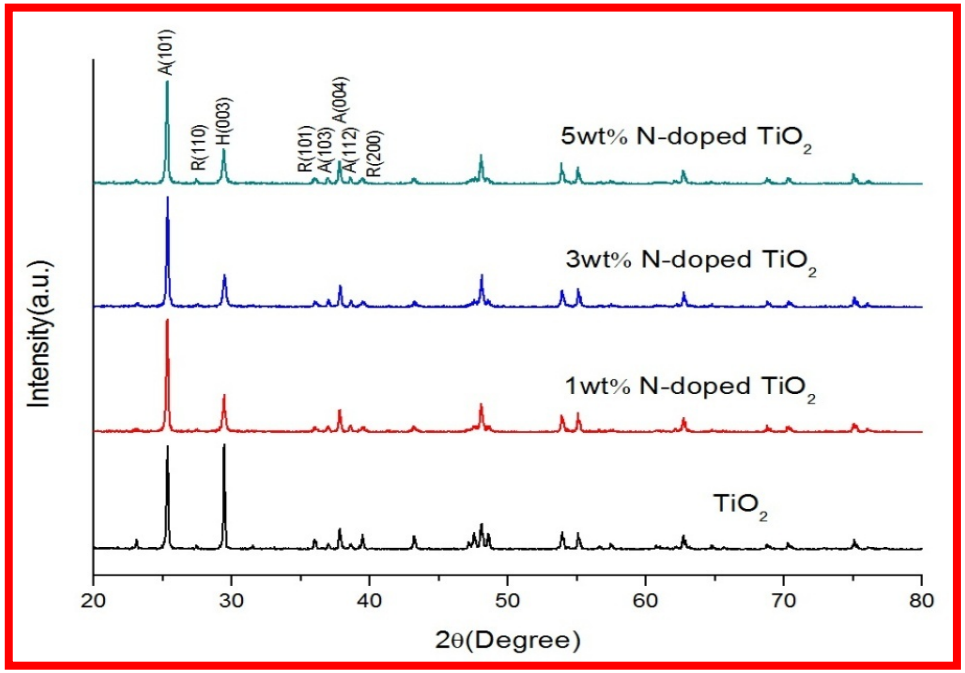




Degradation of RhB by $ZnTiO_3$

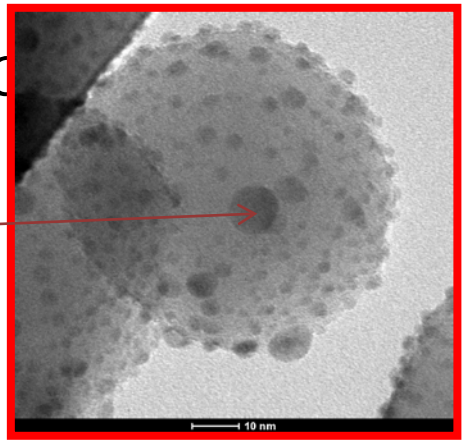
Milled-TiO_2 doped with N and Ag



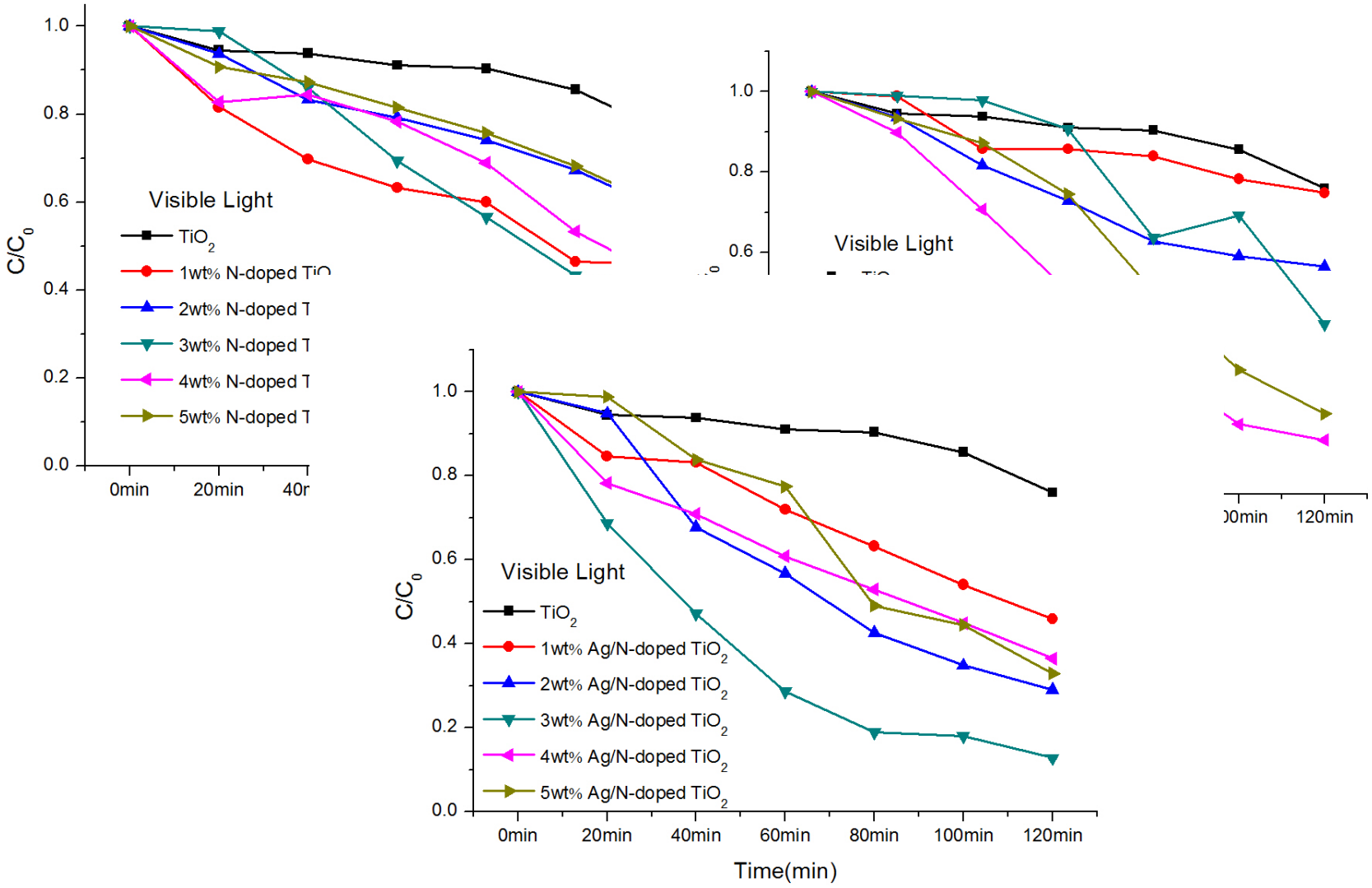


Ag- doped

Ag

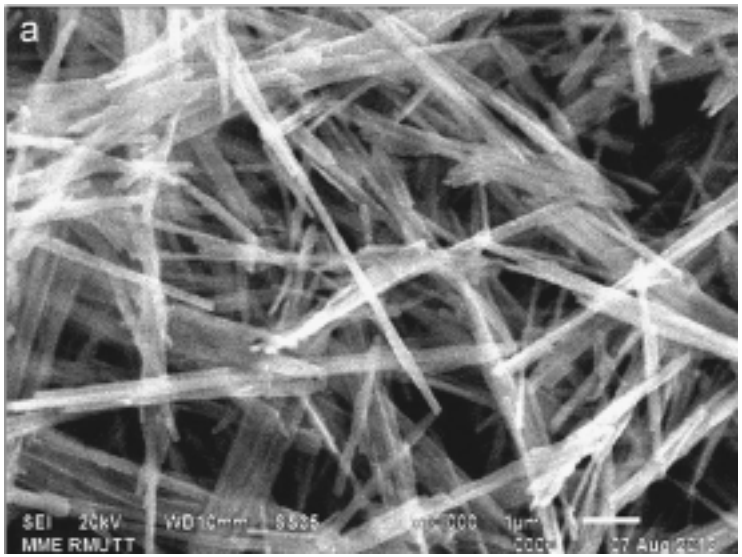


N - doped TiO_2


C/C0
Visible Light
TiO2
1wt% N-doped TiO
2wt% N-doped T
3wt% N-doped T
4wt% N-doped T
5wt% N-doped T
0min
20min
40r
Visible Light
0min
120min
C/C0
Visible Light
TiO2
1wt% Ag/N-doped TiO2
2wt% Ag/N-doped TiO2
3wt% Ag/N-doped TiO2
4wt% Ag/N-doped TiO2
5wt% Ag/N-doped TiO2
0min
20min
40min
60min
80min
100min
120min
Time(min)

Base Technology 2 (RMUTT)

- Photocatalyst from Indigenous Minerals



Ilmenite

Nano-fiber Photocatalyst

Low-cost Nanomaterials from Thai Resources for Energy Applications

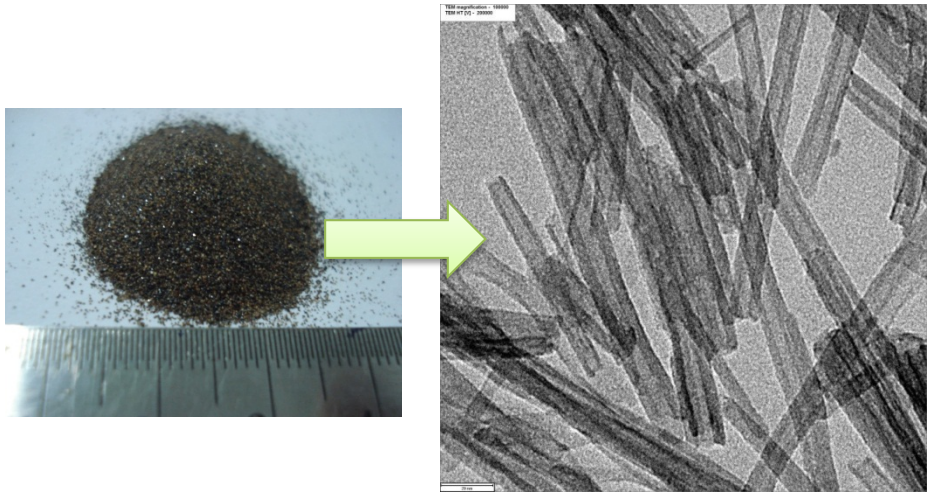


Fig. 1 Low-cost nanomaterials from Thai mineral.

Fig. 2 Autoclave (made in RMUTT) for nanomaterials preparation.

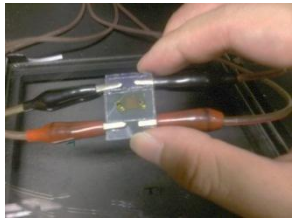


Fig. 2 Applications in solar cells and H_2 production.

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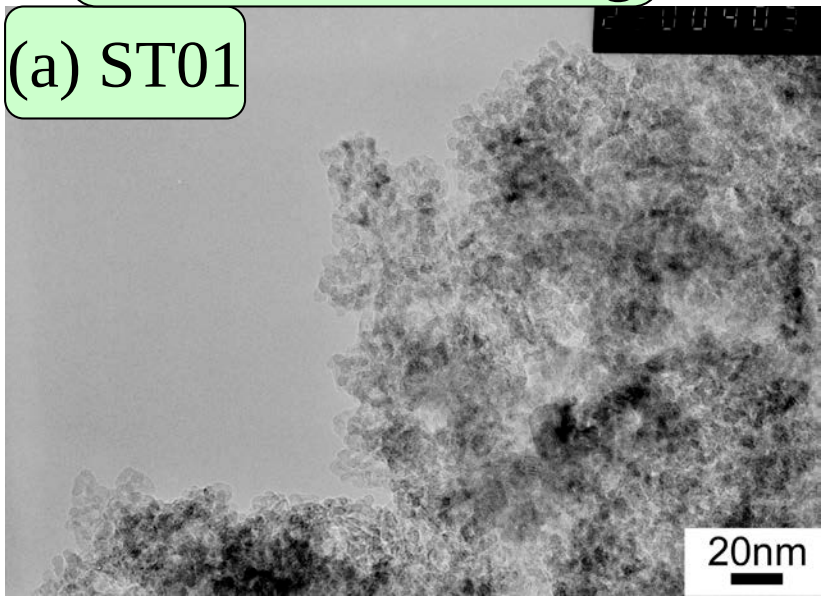
For more information: S. Pavasupree, N. Laosiripojana, S. Chuangchote, and T. Sagawa, *Jpn. J. Appl. Phys*, 2011; 50: 01BJ16.

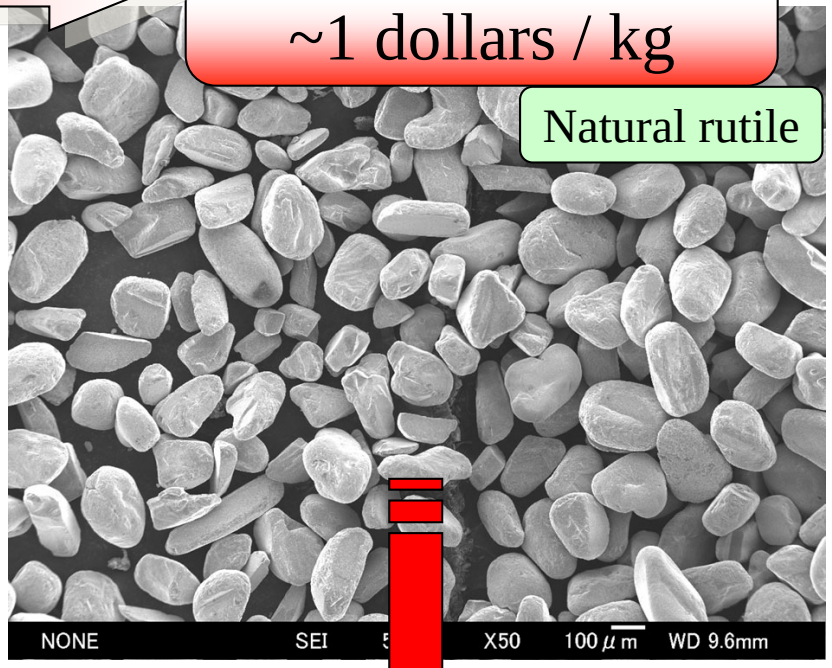
Other work
~50-100 dollars / kg

This work
~1 dollars / kg

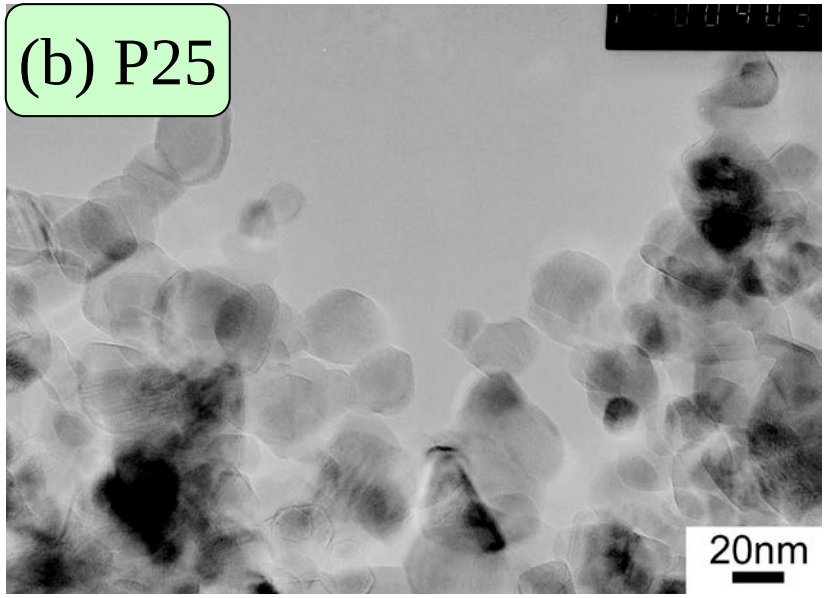
(a) ST01



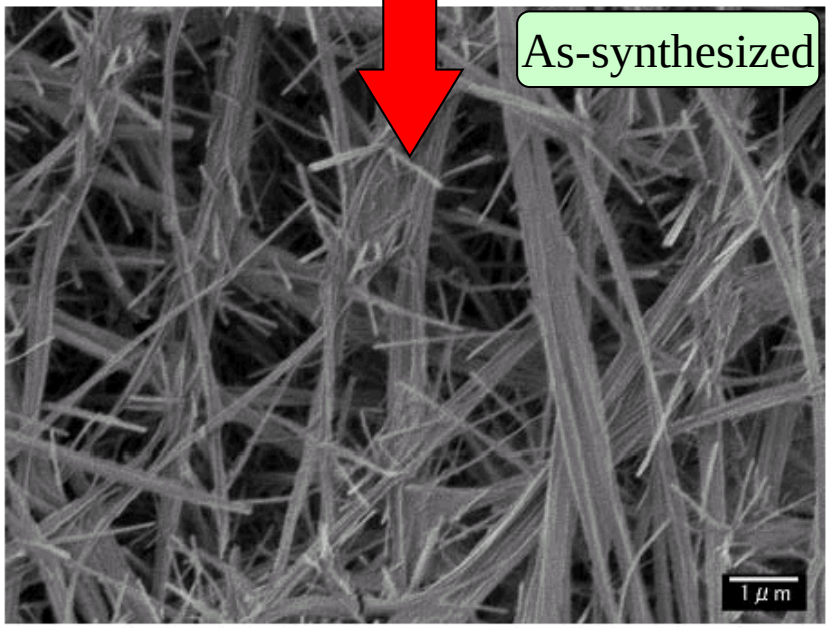
Natural rutile



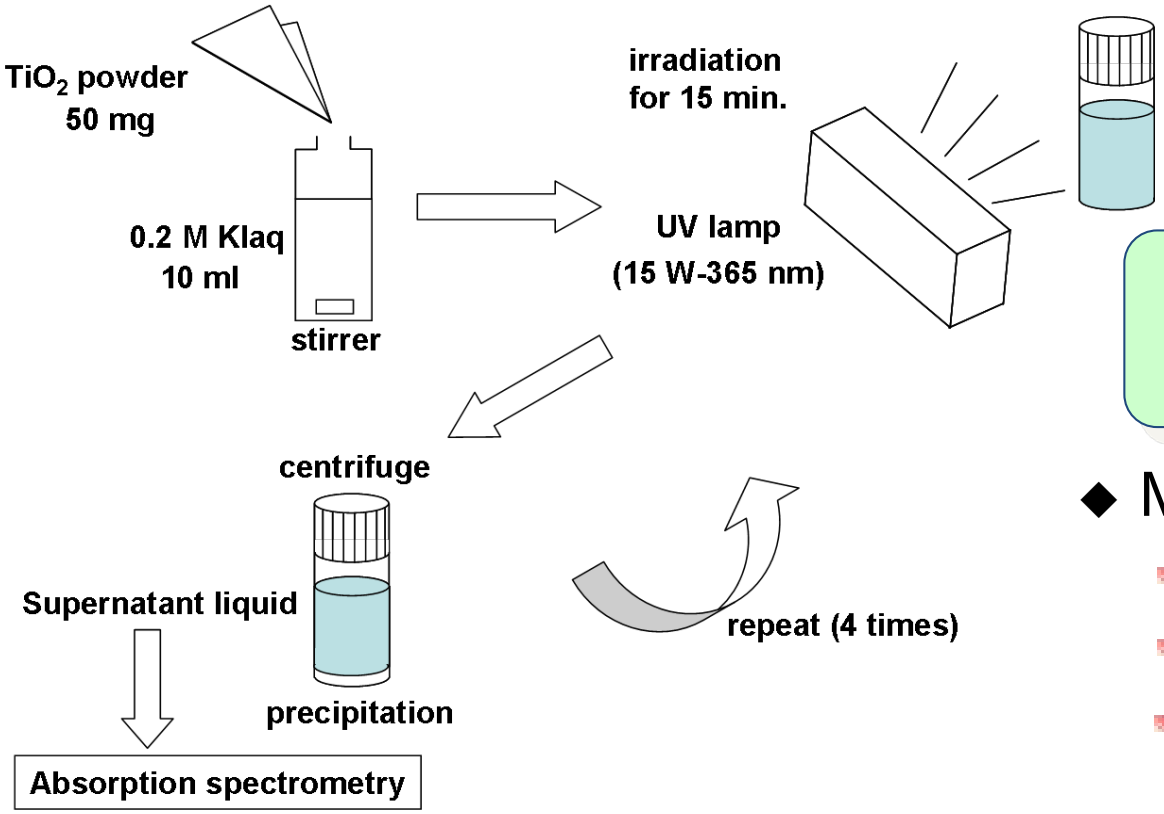
(b) P25



As-synthesized



Y. Suzuki, S. Pavasupree, S. Yoshikawa and R. Kawahata, J. Mater. Res., **20** (2005) 1063.

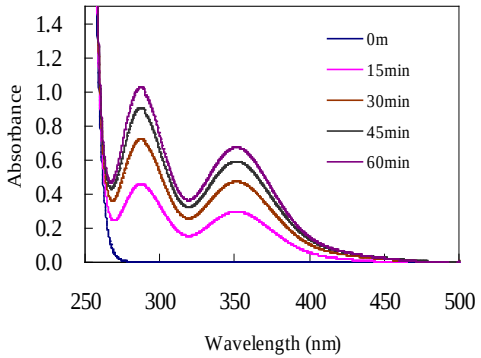


Photocatalytic activity Measurement

- Measurement conditions
  - Samples (50 mg)
  - 0.2 M KI solution (10 ml)
  - λ＝365 nm UV light (15W)

$$2I^- \longrightarrow I_2 + 2e^-$$

$$I_2 + I^- \longrightarrow I_3^-$$



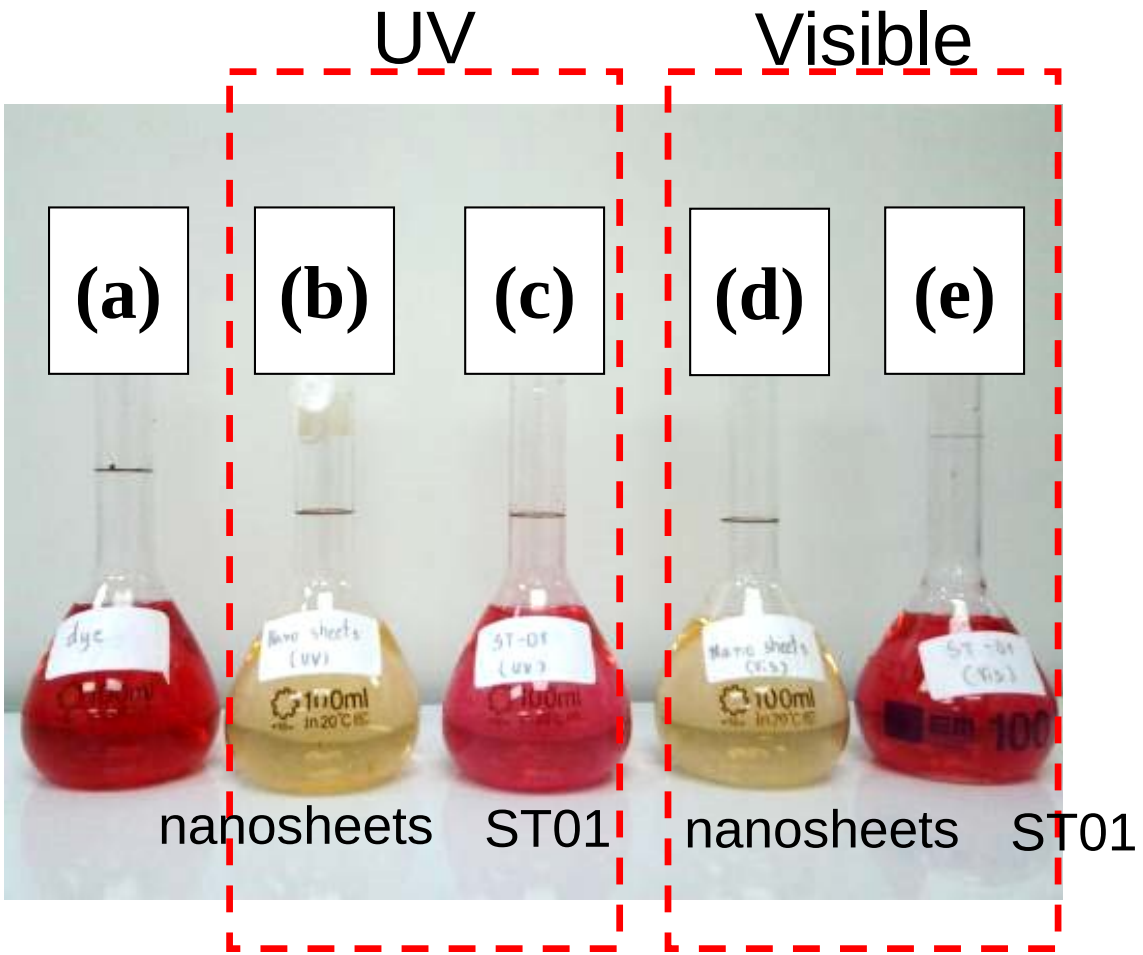
- The concentration of I_3^- was determined using molecular extinction coefficient of I_3^- at 288 nm.

M.Adachi, Y.Murata, M.Harada, and S.Yoshikawa, *Chem.Lett.*, 942 (2000)

S. Sakulkhaemaruethai, S. Pavasupree, Y. Suzuki, S. Yoshikawa, Mater. Lett., 59 [23] 2965-2968 (2005).

R. Yoshida, MS. Thesis, Graduate school of energy science, Kyoto university (2004)

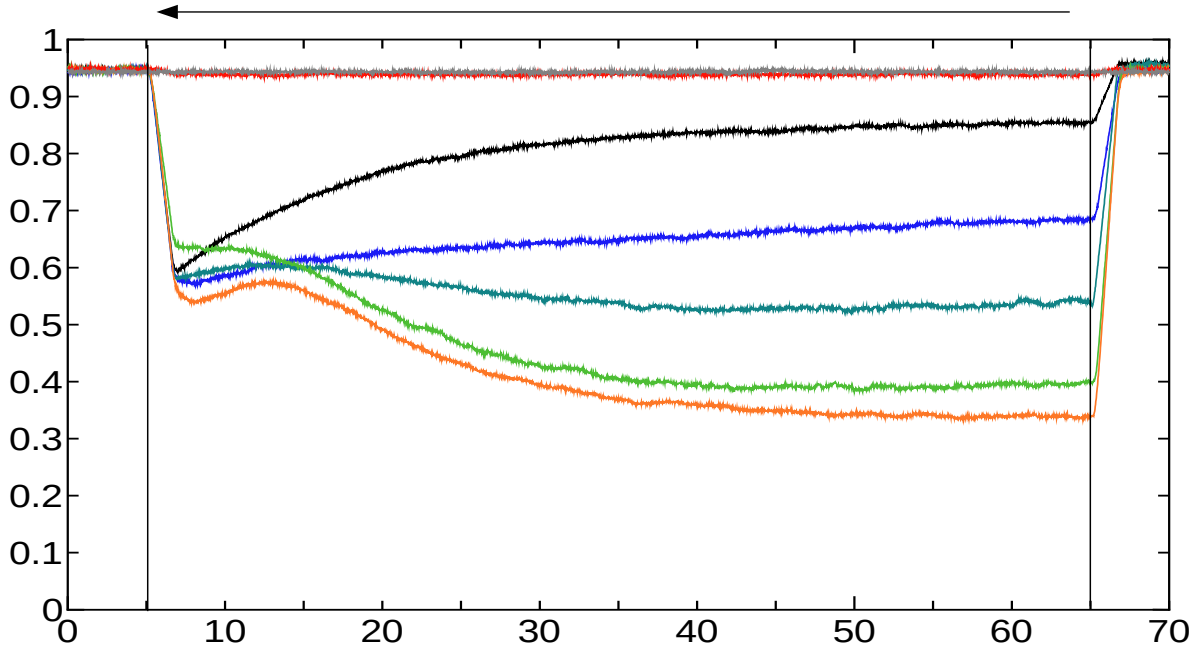
Photocatalytic activity from Textile Waste Water



Photos of waste water from textile dying and waste water after radiation (a) without nanosheets, with (b) nanosheets under UV light (c) ST-01 under UV light (d) nanosheets under visible light (e) ST-01 under visible light.

Base Technology 3 (Kyoto Univ.)

- Synthesis of Composite Photocatalysts by Mechano-chemical Method



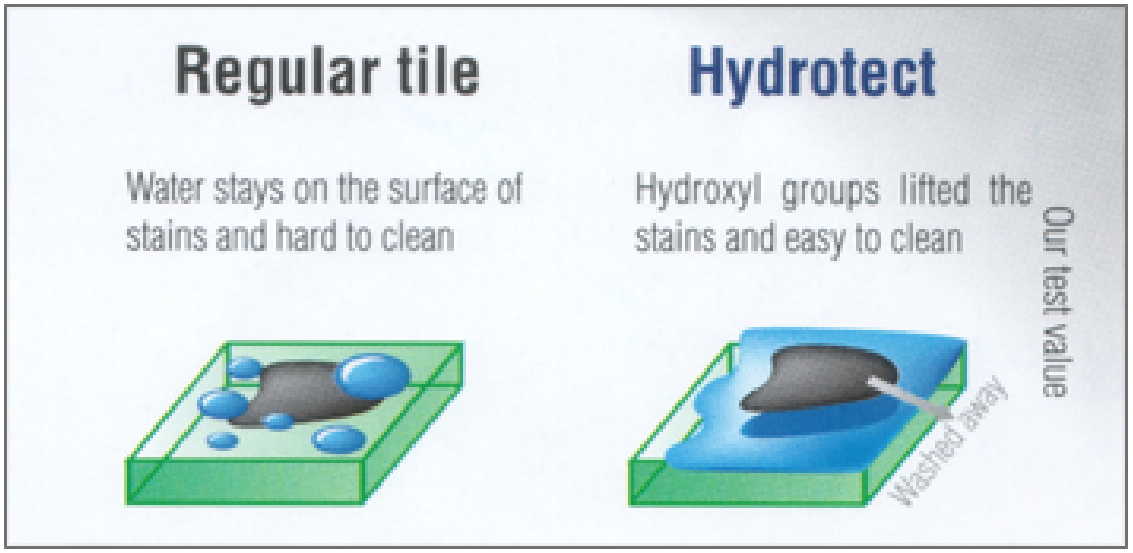
- SmOCl showed lower ability
- BiOCl-SmOCl showed higher ability Which is increasing over the time

NSTDA

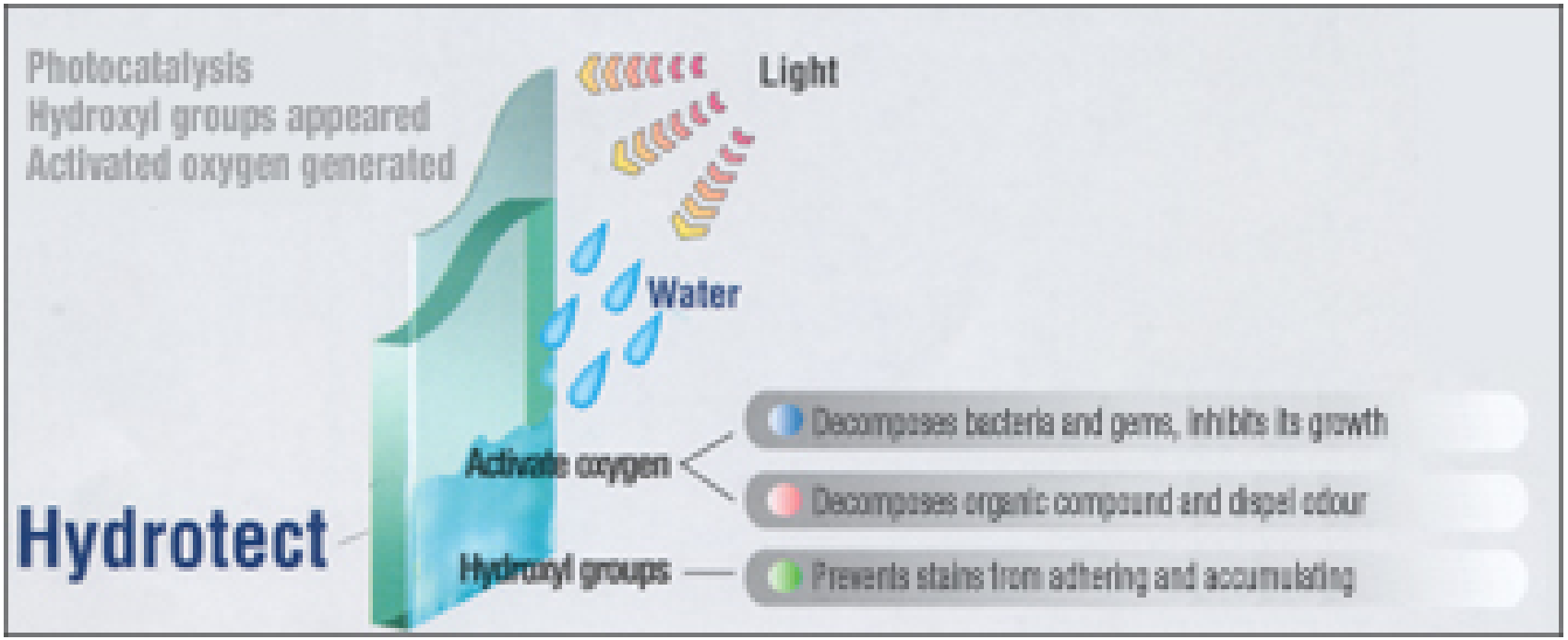
Nano-TiO_2 treatment and application on ceramic tile

Objectives

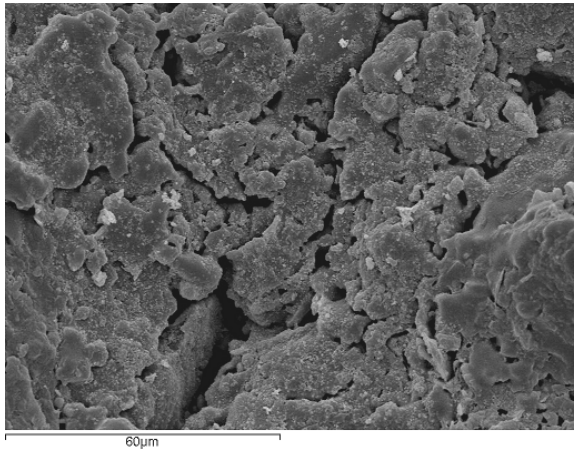
1. To improve photocatalytic properties of nano-TiO_2 synthesized by sonochemistry
2. To make a functional ceramic tile prototype by using the treated nano-TiO_2

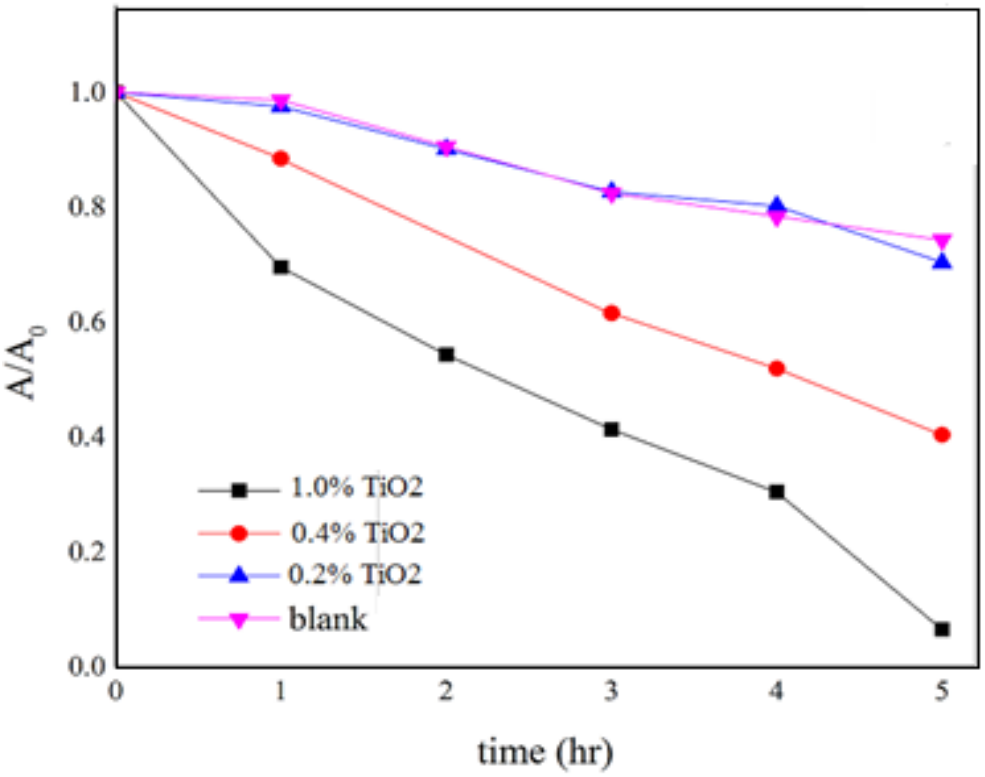


Easy cleaning & Self



http://www.toto.com.hk/tech/hydrotect.html


60µm


1.0
0.8
0.6
0.4
0.2
0.0
A/A0
0
1
2
3
4
5
time (hr)
1.0% TiO2
0.4% TiO2
0.2% TiO2
blank

Target of this program

- Sharing the photocatalysts sample and preparation methods to optimize the quantum efficiency for specific applications.
- Characterization of samples by the team specific equipment and sharing the results.
- Fostering young researchers for sustainable cooperation

Schedule

1st Year
- Settlement Research Facilities
- Preparation of Synthesis

2nd Year
- Synthesis of Photocatalysts
- Basis Characterization

3rd Year
- Evaluation of Photocatalitic Activities
- Confirmation of Appropriate Functions

4th Year
- Optimization and Application test

5th Year
- Commercialization