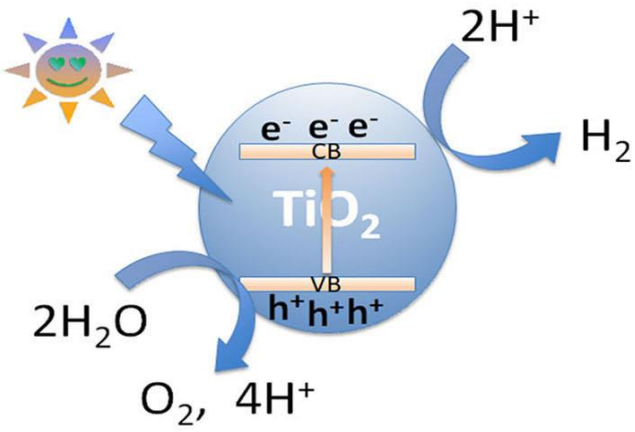
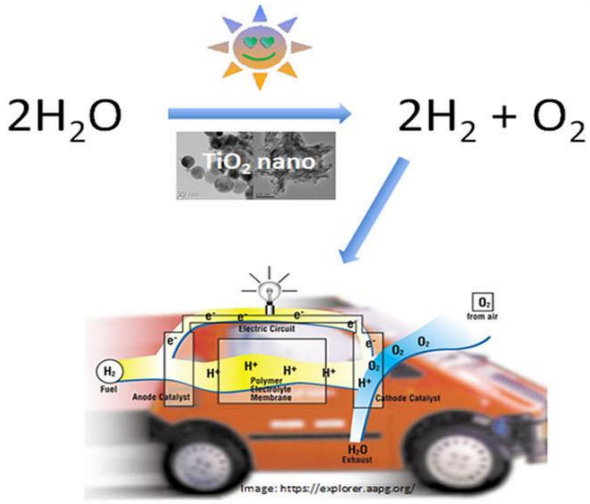
The Graduate School of Science's monthly **Seminar!**



Water splitting reaction by TiO_2 photocatalyst



Potential application:
A fuel cell vehicle (FCV) or fuel cell electric vehicle (FCEV)

Title: TiO_2 Nanoparticles for Solar H_2 Production from Water Splitting

Date/ time: 26 June 2020/ 9:00 AM-10:00 AM, **How:** due to covid-19 pandemic, the seminar will be organized online using Microsoft Teams.

Who should attend?

Researchers, academic staffs, M. Sc./M. Eng. students and other senior students are recommended to attend. Interested person (RUPPer or non-RUPPer) can access the Google Form via the URL below for FREE registration BEFORE 23 June 2020.

https://docs.google.com/forms/d/e/1FAIpQLSeDXQmNE1ASAkSYeqGaiB-iHGUkwW9p-bTIU7FkjmMFouyjeg/viewform

Speaker: Sovann Khan, PhD in Nanomaterials Science and Engineering
(Dr. Sovann Khan is a JSPS Post-doc research fellow at Photocatalysis International Research Center, Tokyo Univ. of Science, Japan.)

Join us...to learn and share scientific knowledge!

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TiO_2 nanoparticles for solar H_2 production from water splitting

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Abstract:

Global warming due to the combustion of fossil fuels is one of the greatest threats currently facing the planet and mankind. Alternative energy sources must be explored. Hydrogen (H_2) is considered a clean energy, and can be used in fuel cells. Conventional H_2 production uses natural gas and steam reforming method. However, this process emits CO_2, which is one of the greenhouse gases. Since the Honda-Fujishima effect of water splitting by TiO_2 photocatalyst was reported in the 1970s, a new route of hydrogen production using water splitting technology by photocatalysis becomes much more promising and reliable. Activated by light-energy, a semiconductor photocatalyst was considered to be a promising material to harvest the abundant energy from solar light. With water and sunlight being abundant on Earth, it is theoretically possible to produce an unlimited amount of H_2 using semiconductor photocatalysts. However, due to large bandgaps, which can be activated under UV light only, a semiconductor photocatalyst allows only a very small fraction (~5%) of solar energy to be utilised. Another barrier that limits the efficiency of the photocatalytic activities of those semiconductor materials is the rapid recombination rate between light-generated electrons and holes, which are active species in photocatalytic reactions. In this presentation, new approaches for effective production of TiO_2 nanoparticles are presented. Furthermore, several challenges to improve activities of TiO_2 for H_2 production in visible light based on defect engineering (doping) and polymorphic structures will be also discussed.

Keyswords: TiO_2 nanoparticle, water splitting, H_2 production

References:

1. **Sovann Khan**, Yuta Kubota, Wenwei lei, Norihiro Suzuki, Kazuya Nakata, Chiaki Terashima, Nobuhiro Matsushita, Akira Fujishima, Ken-ichi Katsumata, One-pot synthesis of (anatase/bronze-type)-TiO_2/carbon dot polymorphic structures and their photocatalytic activity for H_2 generation. *Applied Surface Science* (2020) 146650,
2. **Sovann Khan**, Minyeong Je, Donghun Kim, So-Hye Cho, and Taeseup Song*, Heechae Choi, Mapping point defects of brookite TiO_2 for photocatalytic activity beyond anatase and P25, *Journal of Physical Chemistry C* 124 (2020) 10376-10384
3. Heechae Choi, **Sovann Khan**, Junghyun Choi, Dinh T. T. Duong, Seung Yong Lee, Ungyu Park, Kwang-Ryeol Lee, Seungchul Kim, and So-Hye Cho, Synergetic control of band gap and structural transformation for optimizing TiO_2 photocatalysts, *Applied Catalysis B: Environmental* 210 (2017) 513-521
4. **Sovann Khan**, Haneol Cho, Donghun Kim, Sang Soo Han, Kyu Hwan Lee, So-Hye Cho, Taeseup Song, and Heechae Choi, Defect engineering toward strong photocatalysis of Nb-doped anatase TiO_2: Computational predictions and experimental verifications, *Journal of Applied Catalysis B: Environmental* 206 (2017) 520-530.

Sovann's publications found here Google scholar and ORCID

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EDUCATIONS AND TRAININGS

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Doctoral degree (GPA 4.2/4.5)/Nanomaterials Science and Engineering, Korea Institute of Science and Technology (KIST) and University of Science and Technology (UST), South Korea

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