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From the Editor's Desk

Greetings and a warm welcome to the first issue of ISAJ Newsletter for 2018!

In this issue, we present three articles dealing with the diverse topics. While two are inclined towards climate change, one deals with the study on central effects of an anti-diabetic drug on blood glucose level and pancreatic β-cell functions.

Under the section Research Update of this issue, the author Priyanka Verma presents excerpts from her project focusing upon the enhancement of plasmonic photocatalytic activities in metallic nanostructure by using localized surface plasmon resonance (LSPR) effect, responsible for triggering the thermal conductivity and enhanced generation of excited states in the vicinity of the nanoparticle.

In the wake of global climate change phenomena and the extreme weather events faced by the world currently, in the article under Research Spotlights section, the author Archna Jayaraman summarizes the ongoing research on sustainable development of the UNESCO Cultural Landscape sites using multidisciplinary approaches incorporating three sustainable development strategies namely economic growth, social inclusion, and environmental stewardship.

We also present an article by one of the best poster awardees at the 6th annual ISAJ Symposium-2016, under the section From the Pen of Young Mind. Author Parmila Kumari summarizes her study aiming at investigating the central effect of liraglutide which is used as an anti-diabetic drug worldwide. It lowers blood glucose primarily by stimulating the pancreatic β-cells without increasing body weight. Her research presents new clinical perspectives on the treatment of type 2 diabetes by using liraglutide.

We are happy to announce the **9th ISAJ annual symposium "Interdisciplinary Science and Technology for Safety and Quality of Life"** is going to be held on **7th Dec 2018 (Friday)** at **AIST Auditorium, Tsukuba**. All of you are cordially invited to attend the symposium and make presentations on your research activities. We seek your cooperation in making this annual event, organized by the Indian scientific community, a success!

We hope you would find the current issue of our Newsletter interesting. We look forward to receiving your feedback, as well as any suggestions/ ideas for improving the newsletter in the future.

In This Issue

News and Notes

9th ISAJ Annual Symposium

Theme: Interdisciplinary Science and Technology for Safety and Quality of Life

Date: 7th Dec 2018 (Friday)

Venue: AIST Auditorium Tsukuba

Grant Application announcement

Application for Grants-in-Aids for Scientific Research [Kakenhi] are open

Agency: JSPS Japan

Last Date: Check with your institute

Visible-light-enhanced hydrogen production from ammonia borane utilizing silver based plasmonic photocatalysts

Dr. Priyanka Verma

Osaka University, Osaka

Email:

verma.priyanka@mat.eng.osaka-u.ac.jp

Currently, specially appointed Assistant Professor in the Materials and Manufacturing Science department, Graduate School of Engineering at Osaka University. She has completed her doctorate from the same department at Osaka University. She completed her under-graduation in Chemistry from St. Stephens College, University of Delhi, in 2012 and the graduate degree from Indian Institute of Technology, Hyderabad in 2014.

Her research interests include synthesis and characterization of visible light sensitive plasmonic photocatalyst materials for energy and environment-related applications.

The proliferation of greenhouse gas emissions and climatic changes create an urgency to replace fossil fuels with clean and renewable energy sources. An abundant and reliable source of solar energy is receiving immense interest to solve the problem of increasing energy demands and environmental concerns. Significant efforts have recently been devoted to achieve NPs with precise architectures, in which the size, composition and morphology are controlled.

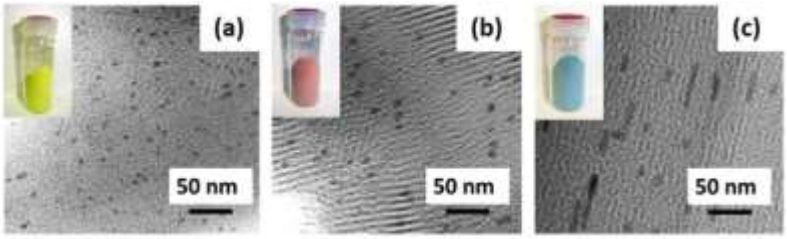

Fig. 1 TEM micrograph of size and color controlled Ag/SBA-15 (a) yellow (b) red (c) blue

Metallic nanostructures such as gold, silver or copper not only have interesting physical properties and lively colors but can also absorb specific visible and infrared light owing to the localized surface plasmon resonance (LSPR) effect. This light-responsive process can trigger thermal conductivity and enhanced generation of excited states in the vicinity of the nanoparticle. The metal nanostructures introduced into the transparent mesoporous silica-based supports enhances the catalytic performance of metallic nanocatalysts through light-excited LSPR.

In our recent research, we describe a method for the synthesis of Ag NPs, the color of which can be altered by changing the size and morphology [1-3]. This method involves microwave heating and the use of SBA-15 mesoporous silica material. The localized surface charge of these Ag NPs resulted in enhanced catalytic activity under visible light irradiation. As expected, the enhancement was dependent on the morphology and color of Ag NPs used. The obtained several Ag catalysts along with their TEM micrographs shown in Fig. 1, exhibited different catalytic activities in the H2 production from ammonia borane (NH3BH3) under dark conditions. The catalytic activities are specifically enhanced under the light irradiation for all Ag catalysts, especially blue nanorod, shown in Fig. 2. The order of increasing catalytic activity was found to be in accordance with the Ag-LSPR absorption intensity.

It is reasonable to expect that plasmonic photocatalysis will play more important roles in the near future, including energy and environmental applications in air cleaning, water splitting and CO_2 reduction. To date, the research conducted on plasmonic nanostructures has illustrated

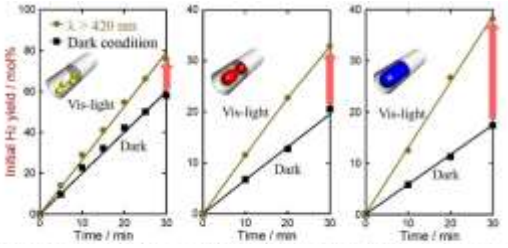

Fig. 2 Time course of hydrogen production by Ag/SBA-15 in dark (•) and under light radiation (■)

to be one of the most promising materials for solar to chemical energy conversion. Furthermore, major advancements are needed for their mechanistic pathway, theoretical predictive models (FDTD simulations) and new synthetic strategies.

References:

1. P. Verma, Y. Kuwahara, K. Mori, H. Yamashita, *J. Mater. Chem. A*, **2015**, 3, 18889.
2. P. Verma, Y. Kuwahara, K. Mori, H. Yamashita, *J. Mater. Chem. A*, **2016**, 4, 10142.
3. P. Verma, Y. Kuwahara, K. Mori, H. Yamashita, *Chem. Eur. J.*, **2017**, 23, 3616.

Multi-disciplinary approaches to climate change research- a brief summary of ongoing research on cultural landscapes

Ms. Archna Jayaraman

UNESCO-HIST

Email: jarchana@radi.ac.cn

Currently, Programme Specialist at the International Centre on Space Technologies for Natural and Cultural Heritage (HIST), a Category II Centre under the auspices of UNESCO in Beijing. She holds a graduate degree in Sustainability from the United Nations University, Tokyo and is working on multi and trans-disciplinary research on the environment.

Her current focus is on World Heritage sites and their conservation. She is also working on program support for providing training and capacity building for heritage site managers and conservators from UNESCO State Parties on the use of space technologies for monitoring and conservation.

The call to adapt multi-disciplinary approaches in research has perhaps been the strongest in the climate change and sustainable development arena. Aiming for and achieving a holistic view of issues, including aspects related to the three pillars of sustainable development: economic growth, environmental stewardship and social inclusion in modern climate research is a tricky prospect in a world where specialization is the norm. Our research attempts to address this issue by focusing on UNESCO Cultural Landscape sites, wherein the interplay between the aforementioned pillars is their defining feature and the harmony between them is critical to the conservation of these sites.

"A cultural landscape is a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person, or exhibit other cultural or aesthetic values"[1]. They are a category under UNESCO's World Heritage List, and their inclusion aims "to reveal and sustain the great diversity of the interactions between humans and their environment, to protect living traditional cultures and preserve the traces of those which have disappeared"[2]. Our research focuses on comparative studies of Asian agricultural landscapes in China, Indonesia and the Philippines, all known for being mountainous, cultivated terrace landscapes with rice as the major crop. All three sites share many commonalities, most prominent being that their origins and maintenance are deeply interlinked with traditional communities which have created and resided in these areas for a significant time period.

The research follows an interlinked threats and enablers analysis approach by analyzing the following aspects:

1. Commonalities in the physical and intangible elements-including soil, topography, cropping patterns, resource governance structures etc.
2. Physical environment analysis: resource flow and quantification of the environmental challenges, using climate modeling techniques, remote sensing and GIS.
3. Social system analysis and impacts of physical change and environmental change
4. Economic and policy threats

Based on the analysis, the research aims to develop common enablers for the conservation and maintenance of these sites which uphold their 'outstanding universal value'.

References:

1. Page, Robert R., Cathy A. Gilbert, and Susan A. Dolan. 1998. A guide to cultural landscape reports. Washington, DC: Government Printing Office.
2. UNESCO WHC. Cultural landscapes. Accessed from http://whc.unesco.org/en/culturallandscape on July 19, 2017.

Central GLP-1 receptor agonist promotes insulin release and lowers blood glucose

Dr. Parmila Kumari

Jichi Medical University Japan

Email:

parmi.choudhary89@gmail.com

Currently, a post-doctoral research fellow at Department of Physiology, School of Medicine, Jichi Medical University, Japan since, October 2014.

She did doctorate from Saitama University in Molecular science in 2014. She completed undergraduation and graduation from the University of Rajasthan, India in 2008, and 2010, respectively.

Her research theme involves blood glucose homeostasis by central administration of GLP-1R agonist.

She is one of the best poster awardees in ISAJ annual symposium 2016.

The glucagon-like peptide-1 (GLP-1) is an incretin derived from intestinal endocrine L cells in response to nutrients and stimulates insulin release from pancreatic β-cells. GLP-1 exhibits a very short half-life in plasma due to degradation by dipeptidyl peptidase-IV (DPP-IV), which compromises its therapeutic potential. To overcome the problem of the short duration of GLP-1 action, GLP-1 receptor agonists resistant to DPP-IV have been developed.

Liraglutide is a long-acting human GLP-1 agonist designed for protection from degradation by DPP-IV. Liraglutide is now used as an anti-diabetic drug worldwide. Liraglutide lowers blood glucose primarily by stimulating the pancreatic β-cells without increasing body-weight, providing an advantage over most of other anti-diabetic drugs. In addition, it was reported that peripherally administered liraglutide could access the brain directly. However, whether the central action of liraglutide regulates blood glucose and drives the regulation of β-cells is unclear. My study aimed to investigate the central effect of liraglutide on blood glucose level and pancreatic β-cell functions.

I used C57B6J male mice to test the central action of liraglutide. Liraglutide dose 2μg/2μl was injected in lateral ventricle (LV) of the brain in mice followed by measurement of plasma insulin and blood glucose post- 30 and 90 minutes, respectively. C-Fos immunoreactivity in various brain nuclei was checked at 90 minutes post-administration of the drug. Results of the study showed that central administration of liraglutide in mice potentiated β-cells proliferation, increased plasma insulin levels, and decreased blood glucose without affecting liver glycogen contents and serum corticosterone. Moreover, the effect of liraglutide was blocked by intraperitoneal (ip) administration of atropine. Furthermore, increased c-Fos immunoreactivity was observed in cholinergic neurons in dorsal motor nucleus of vagus in brain stem and in POMC neurons in ARC and NTS. The results indicate that liraglutide stimulates the neurocircuit involving the hypothalamic and brain stem area of the brain, which is relayed to pancreatic β-cells via parasympathetic pathway to promote proliferation, to induce insulin release, and thereby lower blood glucose.

The present study may provide a rationale for new clinical perspectives on the treatment for type 2 diabetes by liraglutide.

Contact Us

Feel free to write to us

For any info about ISAJ and membership:
isaj@gmail.com

To subscribe our newsletter:
isaj.newsletter@gmail.com

Visit us on the web at www.isaj.org

Editor

Mahendra Kumar Pal, PhD

Hyogo Earthquake Research Center (E-Defense)

National Research Institute for Earth Science and Disaster Prevention (NIED)

Write @: er.mahendra.biet@gmail.com