

Date: 1 December 2023 (Friday)

Venue: Room 4504 (near Lifts 25-26), [\(Location\)](#)

Time: 4:00 – 5:20 pm

HKUST

Language: Putonghua

Seminar I 4:00 – 4:40	<b>High Energy Density and Low-Cost Na-S Batteries</b> <b>Prof. Yan Yu</b> , University of Science and Technology of China
Seminar II 4:40 – 5:20	<b>Layered Double Hydroxide Based Nanostructured Photocatalysts for Solar Fuels and Valued-added Chemicals</b> <b>Prof. Tierui Zhang</b> , Technical Institute of Physics and Chemistry, CAS

### Seminar I

## High Energy Density and Low-Cost Na-S Batteries

**Prof. Yan Yu**

Professor of Materials Science

University of Science and Technology of China

### Abstract

Room temperature sodium-sulfur (RT Na-S) battery is considered as one of the most promising energy storage devices because of its high energy density and low cost. However, several challenges including low electronic conductivity of S, shuttle effect and slow conversion of polysulfides, and dendrite growth of Na anode lead to low reversible capacity, short cycle life and potential safety hazards of RT Na-S batteries. Rational design and construction of S cathode and Na anode composite materials is the key to achieve advanced RT Na-S batteries. Based on this consideration, we select and synthesize efficient catalytic materials by theoretical calculation and experimental optimization, which effectively reduce conversion reaction barrier of sulfur and enhance utilization and reaction kinetics of S cathode. Besides, we propose the protection strategies for Na anode associated with constructing conductive skeleton and artificial interface protection layer, which effectively induce uniform deposition of Na, suppress Na dendrites growth and buffer volume expansion of Na anode. In addition, we reveal electrochemical reaction mechanism of RT Na-S batteries by systematic in situ characterization technologies, which provide important scientific guidance for developing novel high-performance RT Na-S batteries.

### About the Speaker

Yan Yu is a full professor of material science at University of Science and Technology of China (USTC). She received her Ph.D. at USTC in 2006. From 2007 to 2008, she worked as a postdoctoral researcher at Florida International University. After that she received a Humboldt Research Fellowship and the Sofja Kovalevskaja award from the Alexander von Humboldt Foundation and worked at the Max Planck Institute for Solid-State Research in Stuttgart, Germany. Her current research interests mainly include the design of novel nanomaterials for clean energy, especially for batteries and the fundamental science of energy-storage systems. She was selected as a Thomson Reuters Highly Cited Researcher in the field of Materials Science. She also received several awards and honors, such as the National Science Fund for Distinguished Young Scholars, The 16th China Youth Science and Technology Award, Fellow of The Royal Society of Chemistry, etc.



## Seminar II

# Layered Double Hydroxide Based Nanostructured Photocatalysts for Solar Fuels and Valued-added Chemicals

Prof. Tierui Zhang

Professor

Technical Institute of Physics and Chemistry, CAS

### Abstract

The development of photocatalysis technology is much related to the advance of highly efficient and low-cost photocatalysts. Layered double hydroxide (LDH) based nanostructured materials have been considered as very promising photocatalysts for chemical fuels and products. Recently, a series of LDH-based nanostructured photocatalysts have been designed and synthesized in my group for efficient CO, CO<sub>2</sub> and N<sub>2</sub> reduction into high value-added heavy hydrocarbons, light olefins and ammonia, respectively, by introducing oxygen vacancies and heterostructured interfaces to activate reactants and intermediate species. For instance, by constructing heterogeneous interface structure, NiO/Ni nanocatalysts exhibited an unexpectedly high selectivity of 60% for C<sub>2</sub>-C<sub>7</sub> hydrocarbons in the CO hydrogenation reaction under visible-light irradiation.<sup>[1-10]</sup>

### References:

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### About the Speaker

Dr. Tierui Zhang is a full Professor in Technical Institute of Physics and Chemistry (TIPC), Chinese Academy of Sciences (CAS) and Director of Key Laboratory of Photochemical Conversion and Optoelectronic Materials, CAS. He received his B.S. in Chemistry in 1998, and Ph.D. in Organic Chemistry in 2003 from Jilin University in China. After that, he did postdoctoral study in Max Planck Institute of Colloids and Interfaces with Prof. Markus Antonietti and Dr. Charl Faul (2003-2004), University of Alberta with Prof. Hicham Fenniri (2004-2005), University of Arkansas with Prof. Z. Ryan Tian (2005-2007) and University of California-Riverside with Prof. Yadong Yin and Prof. Yushan Yan (2007-2009), respectively. His research activity focuses on catalyst nanomaterials for energy conversion such as photocatalytic solar fuels and value-added chemicals. He has published more than 330 peer reviewed SCI journal articles in international famous journals such as *Nat. Catal.*, *Nat. Commun.*, *Adv. Mater.*, *Angew. Chem.* and *J. Am. Chem. Soc.* These publications have earned him to date over 37000 citations with H-index 108. He was named in the annual Highly Cited Researchers 2018-2023 List by Clarivate Analytics. He was granted 44 national invention patents in China. Dr. Zhang is the associate editor of *Science Bulletin*, *Industrial Chemistry & Materials*, *Nano Research Energy* and *Transactions of Tianjin University*, and also serves as an editorial board member for peer-reviewed journals including *Advanced Energy Materials*, *Advanced Science*, *Chemical Science*, *Small Methods*, *Small Structures*, *Scientific Reports*, *ChemPhysChem*, *Materials Chemistry Frontier*, *Solar RRL*, *Carbon Energy*, *Innovation* and *SmartMat*. He is the recipient of a number of awards including Alexander von Humboldt Fellowship, Royal Society-Newton Advanced Fellowship, National High-Level Talents Special Support Program, "Outstanding Young Scholars" of the National Science Fund. He was named a fellow of the Royal Society of Chemistry (FRSC) in 2017 and a fellow of the Chinese Chemical Society (FCCS) in 2023. More information can be found from his homepage <http://zhanglab.ipc.ac.cn>. His ORCID No.: <https://orcid.org/0000-0002-7948-9413>

