

## Design of Nanostructured Catalysts for Sustainable Energy and Environmental Uses

Hiroshi Yamashita<sup>1,2,3,\*</sup>

<sup>1</sup>Graduate School of Engineering, The University of Osaka, Osaka, Japan

<sup>2</sup>SANKEN, The University of Osaka, Osaka, Japan

<sup>3</sup>College of Chemistry and Materials Science, Shanghai Normal University, Shanghai, China

\*E-mail: yamashita@mat.eng.osaka-u.ac.jp

For the development of efficient catalytic processes, designs of “active sites”, “reaction fields” and “energy injection” are very important factors. In the well-regulated nanopores of zeolite, mesoporous silica and MOF, it is possible to control the size and structure of catalytic active sites in forms of fine particles, clusters, molecules, and atomic moieties, and also possible to control the reaction fields with unique properties such as hydrophobicity, acidic-basic and electrostatic fields. Ultrafine semiconductor photocatalysts, single-site photocatalysts, plasmonic catalysts, nano-alloy catalysts, Yolk-shell catalysts, and MOF photocatalysts, can be designed for H<sub>2</sub> production-storage-transportation, CO<sub>2</sub> fixation, H<sub>2</sub>O<sub>2</sub> synthesis, and various reactions for sustainable energy and environmental uses.

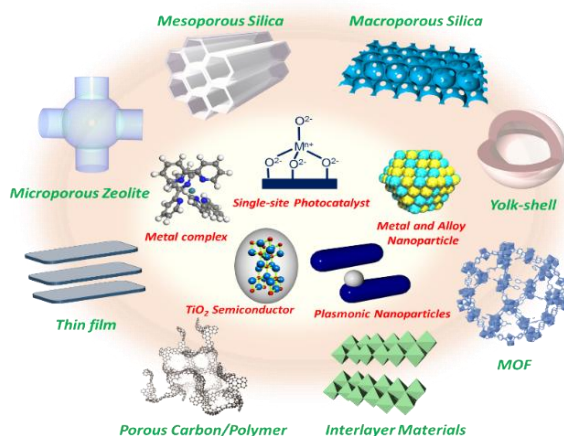


Fig. 1. Design of nanostructured catalysts and photocatalysts using nanoporous materials.

**Keywords:** Nanostructured catalysts; Photocatalysts; Nanoporous materials, Sustainable energy

### Short Bibliography



Hiroshi Yamashita has been a professor of The University of Osaka since 2004. He received PhD degree from Kyoto University in 1987. He was an assistant professor of Tohoku University, an associate professor of Osaka Prefecture University, and an invited professor of University Pierre and Marie Curie. He has been an editor of Applied Catalysis B, a member of Academia Europea, a president of Asia-Pacific Association of Catalysis Societies (2019-2023), and a president of Catalysis Society of Japan (2019-2020). He received awards from Asia-Pacific Association of Catalysis Societies, International Mesostructured Materials Association, Chemical Society of Japan, Catalysis Society of Japan, Japanese Photochemistry Association, the Japan Petroleum Institute, the Japan Institute of Metals and Materials, Japan Society of Coordination Chemistry, Japan Society of Vacuum and Surface Science.