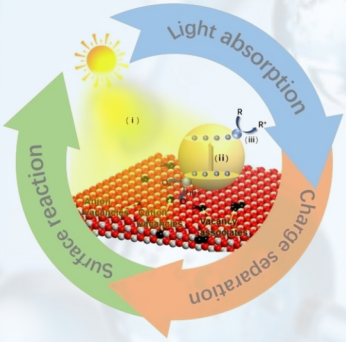
Physics Colloquium

سخنرانی عمومی فیزیک

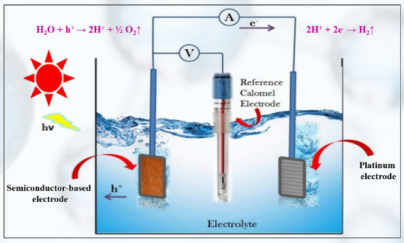
پژوهشکده فیزیک
پژوهشگاه دانش‌های بنیادی (مرکز تحقیقات فیزیک نظری و ریاضیات)
IPM
Institute for Research in Fundamental Sciences
School of Physics

Hydrogen Generation via Photoelectrochemical Water Splitting on Nanostructure Semiconductors: Physics and Technology



Speaker
Prof. Alireza Moshfegh

Affiliation
Physics Department
Sharif University of Technology



Date and time
Wednesday, 24th of Khordad, 1402 (14th of June, 2023), 6 pm

Abstract

According to statistics, the total world energy consumption is ~ 5.8 x 10^{20} J and the world energy demand is expected to double by 2050 with the increase in the population (1.12% per year). In this context, about 83% of today's energy supply originates from fossil fuels (e.g. petroleum, gas and coal) that are responsible for discharging a large amount of CO_2 in the environment after their combustion. The release of CO_2 accounts for ~ 76% of annual greenhouse gas (GHG) emissions which creates severe problems for environment and public health such as global warming and climate changes. Thus, it is an urgent need to develop efficient methods and consume renewable energy for safer society and sustainable development. The water and sunlight (the amount of solar energy strikes the Earth surface continuously is ~ 5.3 x 10^{24} J, that is ~ 10,000 times higher than the world's total energy use) are of the most abundant natural resources on the Earth that can be applied to produce clean energy in order to achieve net zero emissions. After a brief history and introduction on principles of semiconductor - based photocatalysis, physics and technology of hydrogen generation via photoelectrochemical (PEC) water splitting on different photocatalysts including nanostructure (0D, 1D and 2D) semiconducting materials, heterostructures, novel 2D materials and hierarchical nanostructures will be discussed. Then various strategies on materials design and optimization as well as recent advances on solar H_2 production are introduced. Finally, kinetics and mechanism of the PEC derived H_2 production reaction on semiconductor surfaces/interfaces under Ultraviolet - Visible photoirradiation will be discussed.

Link
https://www.skyroom.online/ch/schoolofphysics/colloquium