

Abstract for the general Public

The world's population is increasing every day and the new habitant of this planet need all consumable resources such as food, shelter, clean water, *etc.*, which is not be provided without energy. Possible energy sources such as fossil fuel, nuclear power, and wind can contribute in a mixed form to the future of the planet. However, there is a limitation in the possible resources for fossil fuels along with the unavailability of wind as a viable source of energy. Photoelectrodes are the main part of solar energy devices including photovoltaic cells, photo rechargeable batteries, and photo fuel cells. The development of such systems to increase the stability and efficiency of the system has paramount importance on the future of green energy production and storage. Photo rechargeable batteries are a prevailing idea since solar energy is only available during the daytime, thus a solar energy storage system is necessary to be developed to assure the continuous availability of electrical energy. The proven efficiency of photovoltaic cells (PV) integrated photoelectrochemical cells in solar water splitting, reaching the DOE targets leaves no doubt that future photo rechargeable batteries must consist of PV-integrated battery cells. The design of the system will be based on four important factors, efficiency, durability, cost-effectiveness, and being environmentally friendly. The presented proposal opens a new avenue to design efficient and stable photoelectrodes and electrocatalysts for photo rechargeable batteries.