Suggested Abstract

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Title:

Recent advances in Perovskite-based Nanostructure Solar Cell Systems

Energy and environment are two key issues in modern society which are necessities for the economic and social sustainable development of the world. In 2018, there is 79.5% energy economy that relies on conventional energy sources such as coal, petroleum oil, and natural gas, which are not renewable and environmentally benign. So far, fossil fuels account for about 87% of global energy. Since the beginning of the industrial revolution, economic growth has been driven by a continuous increase of power consumption, which has been possible thanks to the availability, high energy density and low price of fossil fuels. Currently, global demand for energy is growing faster than the capacity and utilization of fossil fuels, which leads to energy shortages. To deal with this problem, there has been a global drive seeking renewable and clean alternatives to fossil fuels.

Moreover, world energy demand due to population growth, Industrial development and Excessive use of modern electrical devices is constantly increasing. Therefore, finding reliable, cost-effective and renewable energy sources is needed for the future. Solar energy, as the cleanest and the largest exploitable resource of energy, can potentially meet the growing requirements for the whole world's energy needs beyond fossil fuels. Consequently, today, the development of renewable and clean energy sources has received global attention as an alternative.

Solar cells or photovoltaic cells are electrical devices that convert light energy directly into electricity by the photovoltaic effect. It is a physical and chemical

phenomenon. These types of cells have electrical properties such as current, voltage, or resistance that change when exposed to light.

Among various combinations of solar cells, Perovskite solar cells (PSCs) have emerged as one of the best in the photovoltaic industry in recent years. Power conversion efficiency (PCE) plays an important role in generating electricity from solar power. PSCs are one of the most important types of solar cells that can be used to produce cheaper solar energy.

In this lecture, I intend to share recent advances in perovskite-based nanostructure solar cells with researchers and enthusiasts present at the conference. Below you can see some of my published papers in this field:

1- "Efficiency improvement of half-tandem CIGS/perovskite solar cell by designing nano-prism nanostructure as the controllable light trapping"

N Solhtalab, MH Mohammadi, M Eskandari, D Fathi

Energy Reports 8, 1298-1308

2- "Textured HTM-free perovskite/PbS quantum dot solar cell: Optical and electrical efficiency improvement by light trapping control"

M Majdi, M Eskandari, D Fathi
Solar Energy 230, 618-627

3- "Light trapping in perovskite solar cells with plasmonic core/shell nanorod array: A numerical study"

MH Mohammadi, D Fathi, M Eskandari
Energy Reports 7, 1404-1415

4- "Effects of the location and size of plasmonic nanoparticles (Ag and Au) in improving the optical absorption and efficiency of perovskite solar cells"

M hosein Mohammadi, M Eskandari, D Fathi
Journal of Alloys and Compounds 877, 160177

5- “Improving the efficiency of perovskite solar cells via embedding random plasmonic nanoparticles: Optical–electrical study on device architectures”

MH Mohammadi, M Eskandari, D Fathi
Solar Energy 221, 162-175

6- “Simulation and investigation of perovskite/nano-pyramidal GeSe solar cell: Realizing high efficiency by controllable light trapping”

M Aliyariyan, D Fathi, M Eskandari, MH Mohammadi
Solar Energy 214, 310-318

7- “Numerical study of a highly efficient light trapping nanostructure of perovskite solar cell on a textured silicon substrate”

A Tooghi, D Fathi, M Eskandari
Scientific Reports 10 (1), 1-13

8- “Design and simulation of perovskite solar cells based on graphene and TiO_2/graphene nanocomposite as electron transport layer”

M Dadashbeik, D Fathi, M Eskandari
Solar Energy 207, 917-924

9- “Efficiency enhancement of perovskite solar cells by designing GeSe nanowires in the structure of the adsorbent layer”

M Aliyariyan, D Fathi, M Eskandari, A Tooghi
Nanotechnology 31 (46), 465405

10- “High-performance perovskite solar cell using photonic–plasmonic Nanostructure”
A Tooghi, D Fathi, M Eskandari
Scientific Reports 10 (1), 1-13

11- “Nio@ gese core-shell nano-rod array as a new hole transfer layer in perovskite solar cells: A numerical study”
MH Mohammadi, D Fathi, M Eskandari
Solar Energy 204, 200-207