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"Power from Sunshine": Solar Energy Harvesting In order to Solve the World Energy Crisis

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ABSTRACT

The growing need for energy by the human society and depletion of conventional energy sources demands a renewable, safe, infinite, low-cost and omnipresent energy sources. One of the most suitable ways to solve the foreseeable world's energy crisis is to use the power of sun.

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Introduction

The growing need for energy by the human society and depletion of conventional energy sources demands a renewable, safe, infinite, low-cost and omnipresent energy sources. One of the most suitable ways to solve the foreseeable world's energy crisis is to use the power of sun. Out of all renewable sources of energy, solar energy plays a vital role in the long-term energy supply security, global climate change and also offers a solution to fossil fuel emissions. Most of the commercial solar panels use silicon as light harvester, which makes the panels heavier, rigid and is very expensive. After extensive research scientists found alternative classes of materials with perovskite crystal structure, which received much attention due to their low-cost potential, light weight, ease of processing. These materials are not yet completely commercialized and are under extensive research. Current studies states that the production of high efficiency, stable, scalable photovoltaic solar cells may lie in the development of perovskite solar cell technology.

Currently, the only major unknown problem in the field of perovskite research is the photo and thermal stability of devices towards its commercialization. In this regard, printable carbon-based hole transport material free PSCs have shown to play a pivotal role for scale-up to meet the demand of simple and low-cost photovoltaic device. Carbon replaces the hole transporting material and the expensive gold electrode which we generally use in solar cell device and further reduces manufacturing cost.

By keeping these in mind, we have developed carbon-based large-area perovskite solar modules (70 cm^2) which give a power conversion efficiency of 13% with excellent device stability in ambient atmosphere (25 ^oC and relative humidity up to 70%)as well as at high temperature (85^oC). Also, the devices provide superior thermal and photo stability which can be further think of its commercialization. In university of Oxford scientists have already worked on commercialization of perovskite solar cells with an extended efficiency up to 28%. Further research going on in order to enhance the efficiency of solar modules up to 37%, which in terms gives the twice the power-converting ability of today's commodity panels.

More over these solar cells are considered as future of solar panels as these solar cells are based on man-made materials that can be produced at low cost. Spraying these perovskite materials as a liquid coating on the substrate allows the high volume manufacture of these materials in low cost compared to the currently used silicon solar cells. The major advantage is perovskite material can be printed or spray coated directly on the glass or any other materials which will reduce the total energy harvesting cost. One more advantage is changing the composition of compound allows the solar cell colour to adjust any desired colour. The walls, windows, roofs of the building can be made by this thin layered coating of perovskite solar cells with the different graphic design or pattern, which acts as great source for energy harvesting. Finally, using solar panels will not only help us in solving world energy crisis, but also definitely make us to contribute for reducing the impact of fossil fuels on climate change. These techniques will increase the awareness of green technologies amongst the public.