Solar Paints for the Next Generation Renewable Energy

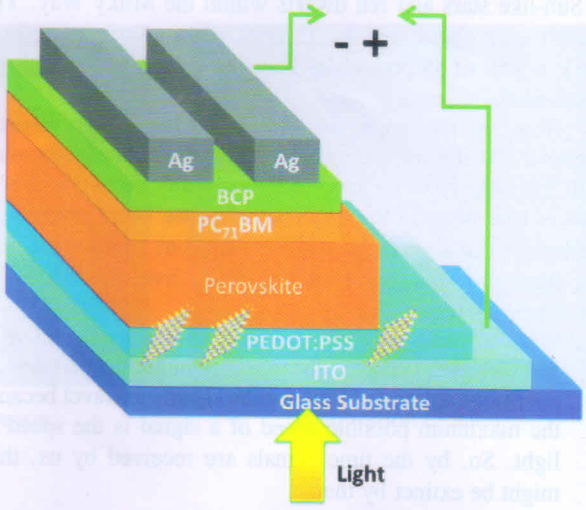
RC Parida and Sachidananda Muni

IN order to meet the dual objectives of the growing global energy demand and side by side, reducing the emission of the greenhouse gases, particularly, that of carbon dioxide, to net zero by 2050, solar energy is considered as one of the important alternative sources that can enable us to divert our dependence from the highly polluting fossil fuels. Therefore, various projects are adopted all over the world to generate this renewable energy, while scientists and technologists are busy developing new processes that can make it more dependable, affordable and efficient. At present, the process that is in extensive use is the installation of solar panels. In India, our government has launched many schemes to popularise it, one of which is the Free Solar Rooftop Scheme 2024. It aims to set up at least one crore solar panels on rooftops around the country. Besides, it has been implementing such projects in inaccessible areas, barren lands and other suitable locations for quite some time. However, recently, some environmentalists have rung the warning bell against its extensive use, which, according to them, is capable of causing a number of environmental hazards.

They point out that each of the solar panels is made up of a frame, solar cells, a back sheet, a protective film, conductors and a tempered glass cover. While the frame is made up of aluminium, the cells are of silicon, the conductors are of copper, and the back sheet of the film is also of silicon from quartz, obtained from mines, which is then processed by heating to a very high temperature and then reacting with chemicals. Similarly, aluminium and copper of the right grades are produced from ores that need mining and processing in factories thereafter. On the other hand, polymers, plastics, and tempered glass also need raw materials and industrial processing. All these require a lot of energy, cause air and water pollution and have large carbon footprints. Besides, the waste generated by solar panels after their life cycles also causes environmental pollution. Unless adequately and properly recycled, those can pose problems as acute as other e-waste. Therefore, scientists are now looking for alternative technologies to harness solar energy in a more clean and eco-friendly manner. Recently discovered spray-on photovoltaics, or simply called spray-on solar paints (and also called spray-on solar cells), are expected to serve the purpose well. When painted with those, walls, roofs, windows and as a matter of fact, any other surface may become a potential solar power plant.

The history of spray-on solar paints can be traced back to the discovery of perovskite in 1839 by a Russian mineralogist, Count Lev Perovski. It is a calcium titanium oxide mineral that can conduct electricity when struck by light. However, its epoch-making use began in 2014 with the development of the light-sensitive spray-on solar paint, which can act as a solar cell at the University of Sheffield. Now the US Department of Energy's National Renewable Energy Laboratory (NREL) has been supporting the research and development.

It is the first type of spray-on solar paint so far developed. Known as perovskite solar paint, after the name of Perovski, it is available in a liquid form, which can be used like a regular paint. The product is synthesised from the nano particles of perovskite (calcium – titanium oxide). According to many scientists, it is a very promising development in the renewable energy sector, because its use is easy, similar to painting a wall and has a high potential for energy conversion rate, as compared to the solar panels now in use. Again, not only the walls or windows but also any other surface, including installed solar panels after their life cycles to generate electricity from the sunlight, can be painted with it.



Schematic diagram of Perovskite