Solar Paint: Solar Energy Harvesting Thin Film

KID: 20230419

Affordable renewable energy generation locally for commercial and residential consumption can help elevate some of the stress on the renewable energy power plants and thereby help us move away from fossile fuels. We can tackle climate change by reaching our net zero and sustainable development goals by adopting this strategy. To reach these targets, we need superior but affordable clean energy technology, which is scalable and deployable easily at any location. The need for technological advancement in photovoltaic technology in terms of harvesting solar energy, deployment and traditional manufacturing is now more than ever by adopting a change in our approach and expanding on the research done by scientists for decades. We are developing clean energy technologies based on groundbreaking research that can convert any surface into a solar panel.

The major advantage of Pavakah's approach is the form factor, utilizing the energy generation potential of built-up areas in the cities (including any surface) along with the cost of large-scale manufacturing and ease of deployment at scale. Our approach can lower the cost of solar PV, leading to faster and larger-scale adoption. The work we are doing at Pavakah Energy is on harvesting solar irradiance on any building, structure or vehicle by transforming them into solar panels. This is done by painting or coating a thin film of solar cells, which will harvest the sunlight and convert it into useful electrical energy. This work has huge applications not only on Earth, but also in space, like satellites, and future structures on the moon or Mars.

The chemical synthesis of these materials can also be made in large quantities without the need for importing major manufacturing equipment, and it is also comparatively cheaper to do so and also environmentally safer compared to the process involved in current Solar PV manufacturing.

But to call any product a truly sustainable technology, it should be recyclable and transformable into something usable after the product reaches its end of life. We are designing our technology based on these principles, and our product "solar paint" is truly one of its kind PV technology, that can be recycled easily compared to existing technologies.

Research into nanomaterials and its applications have come a long way from Richard Feynman saying, "There is plenty of room at the bottom" in 1959 and today where we have powerful handheld electronic devices that are made up of tiny transistors, just tens of nanometers in size. These technological advancements are based on scientific progress in understanding the fundamental building blocks of our universe and have led to engineering marvels and innovative products that are not only necessary for economic gain but also serve as means for the betterment of the general population and improved quality of life for billions of people.

As the energy requirement of our planet increased decade on decade as a result, which also went hand in hand with economic development (Figure-1: How economy vs energy plot through the years), powering the industries and increasing quality of life with the help of fossil fuels. We thought our quest for greater power and economic gain could be fuelled by digging deeper without bothering about the environment and the planet itself that has been sustaining us. After realising the damage we were causing to the atmosphere, environment and the planet as a whole through many independent and collaborative research efforts by climate scientists, geologists and astronomers, we realised the need to develop sustainable energy means.

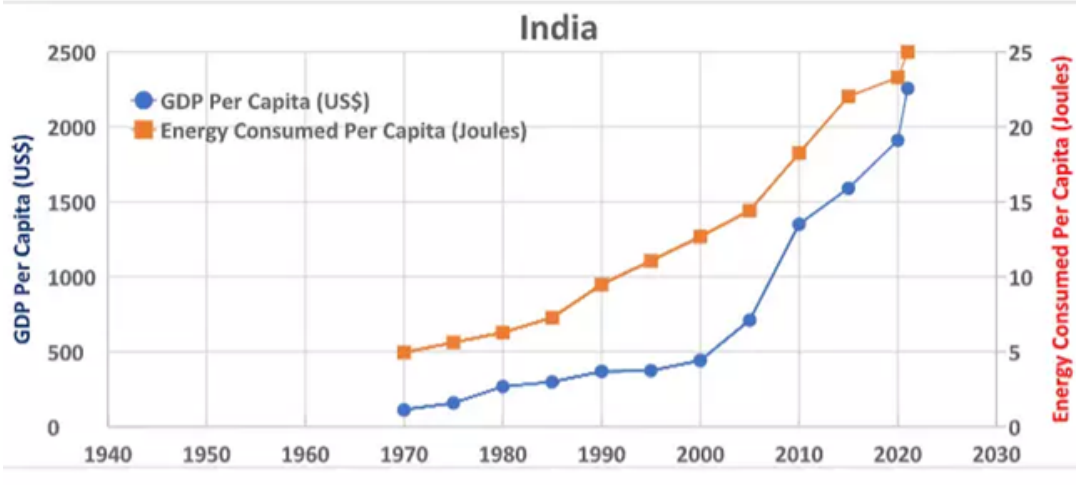

Figure-1: GDP per Capita (US$); Energy Consumed Per Capita (Joules) - India

The advent of solar PV technology, which was developed based on the photovoltaic principle discovered at the beginning of the 20th century, came in the late 70s and early 80s as a technology demonstration more than a serious thought as a commercially viable product for large-scale usage. With the discovery of global warming and the realisation of the threat to the natural world and the delicate balance in the ecological systems, there has been a conscious shift towards developing greener and sustainable energy technologies. Since then, scientists have made great progress in the field of material science to develop new techniques for material synthesis and increase the efficiency and lifetime of solar PV technology.

The Solar PV technology serves as a sustainable and affordable means to harness the sun's abundant energy received by Earth. However, there has been limited development in improving the form factor and adapting the PV technology for large-scale deployment and broader use cases. There is also a need to bring down the cost of solar PV technology manyfold for us to become a truly sustainable civilization. This means affordable clean energy should be accessible to millions of people (residential and businesses) and increase their standard of living at the same time **(Figure-2)**.

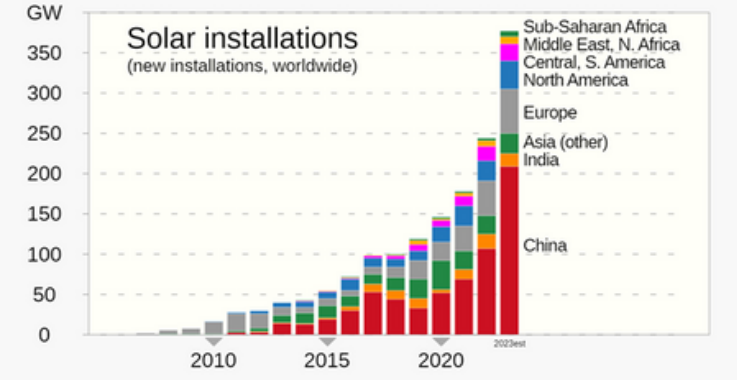

Figure-2: Solar energy adoption rate and projections for the world

Some scientists have envisioned this and worked for decades now and have made good improvements in synthesis techniques for nanomaterials, understanding of charge transfer mechanism in nanomaterials, figuring out how to control the band gap of the nanomaterials, etc. Such incredible work by scientists, however though has not been completely useful for the general public in the form of publicly available data or research articles in reputed journals. To take complete advantage of any research into fundamental sciences, we should be able to translate the knowledge gained in the laboratory into market-validated technology and products.

There has been good progress on thin films and fundamental research on thin film science for developing solar cells in research institutes across the world, and the results are very promising. We are adapting this thin film research combining it with our own work, and translating it to develop our flagship product, solar paint. A paint that can harness solar energy by converting any surface into a solar panel with a coating or painting process **(Figure-3)**. This technology, once developed, has the potential to change the landscape of renewable energy.

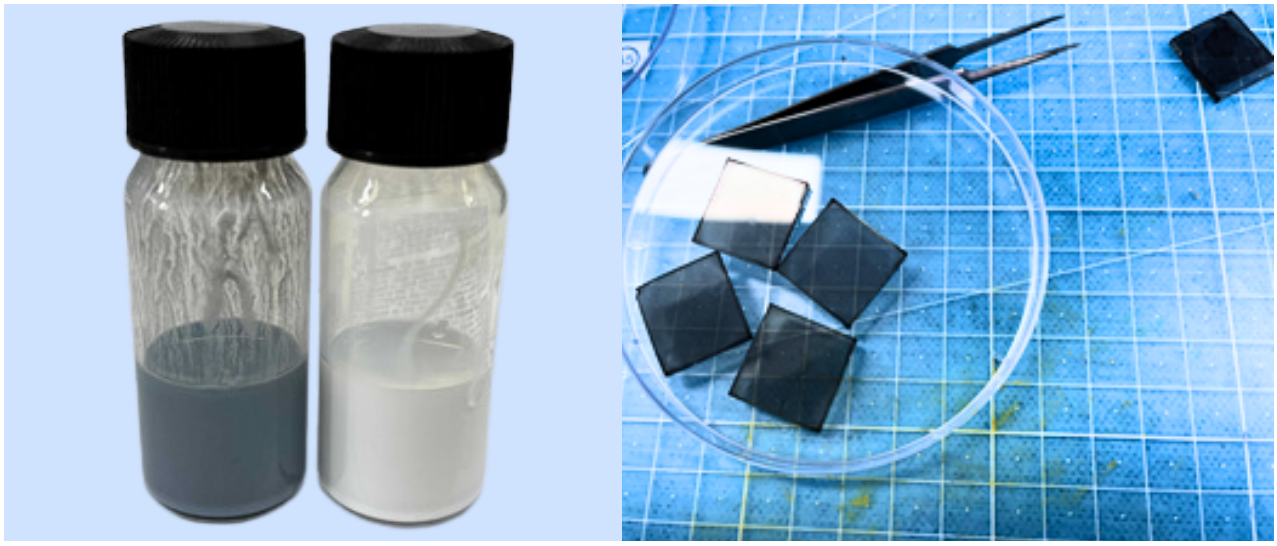

Figure-3: Solar Paint Composition (L) and Glass slides coated with Solar Paint which functions as an electrode (R)

Mr Vikram Bakaraju
Founder, Pāvakaḥ Energy