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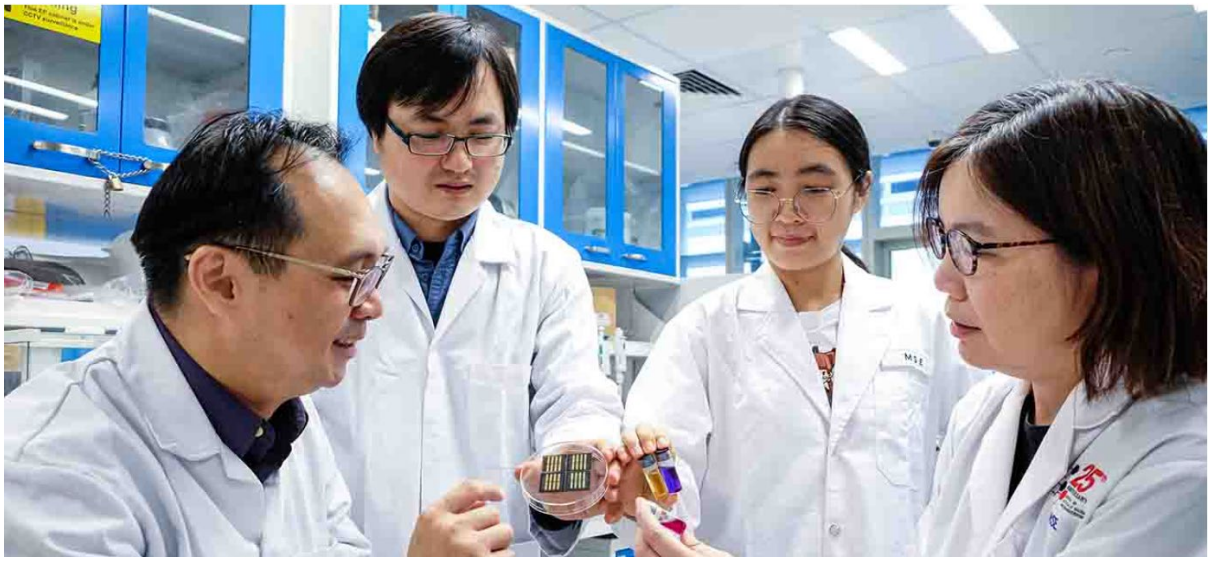
New innovation leads to environmentally friendly solar cells



Agriculture & Climate change, Singapore (Commonwealth Union) – Perovskite is a type of mineral that has a distinctive crystal structure, named after the mineralogist Lev Perovski. Perovskites had significant attention in recent years due to their potential applications in various fields, including photovoltaics, light-emitting diodes (LEDs), catalysis, and energy storage. Perovskite solar cells, in particular, have shown great promise as a low-cost, high-efficiency alternative to traditional silicon solar cells. Perovskites are also used in various electronic devices such as transistors and sensors.

Scientists from the Nanyang Technological University (NTU) have found an effective, stable and environmentally friendly perovskite solar cell that could be put into use in the near future.

Solar cells created from perovskite, that can harvest sunlight and change it to electricity, has a high chance in the utilization as a replacement for silicon solar cells.

Even though the production of perovskite solar cells is more economical and has had enhanced efficiency, its commercial manufacturing has not yet materialized.

Perovskites decompose on exposure to moisture and oxygen or when engaging with light, heat, or utilized for an extended period, causing concerns in regards to a small amount of lead, a toxic heavy metal, present in perovskite solar cells of harming the atmosphere as a solar cell is destroyed or eliminated as indicated by the research team.

The lead emerges from both the perovskite material and a compound utilized in forming a component of the perovskite solar cell, referred to as the capping layer.

Researchers from NTU and the Institute of Materials Research and Engineering (IMRE) at the Agency for Science, Technology and Research in Singapore have presently paved the way for the possibility of capping materials in relation to non-toxic metals applied in the manufacture of perovskite solar cells.

The findings published in Nature Energy last month and led by Prof Sum Tze Chien, Director of the Institute of Advanced Studies at NTU and Associate Dean (Research) of the NTU College of Science, together with Professor Lam Yeng Ming, Chair of the NTU, School of Materials Science and Engineering, could the possibility of perovskite solar cells a step closer to market use.

Perovskite solar cells are produced from several layers of materials, including a perovskite layer that harvests light together with a capping layer. The capping layer is overlayed onto the perovskite layer to guard the solar cell from atmospheric factors like heat and moisture as well as boosting the performance of the cell.

Guaranteeing that the capping layer is adaptable with the underlying perovskite layer, researchers typically applied an approach known as half precursor (HP) method to make the capping layer. One of the precursor chemicals is 1st deposited on top of the perovskite layer giving the other precursor. Via the exchange reaction, the deposited precursor then engages with lead ions situated in the perovskite layer under to produce a lead-based chemical compound forming the capping layer.

“One of the biggest drawbacks of using perovskite solar cells is their impact on the environment. By enabling zinc and other non-toxic metals to be used in the capping layer, our innovation potentially solves a major obstacle that prevents the widespread use of perovskite solar cells,” explained Dr Ye Senyun, research fellow from the NTU, School of Physical and Mathematical Sciences, a lead researcher of the study.

Co-lead author Dr Rao Haixia, research fellow from the NTU, School of Materials Science and Engineering, says “As our method does not require extracting lead ions from the perovskite, this enables the possibility of using a wide range of materials to boost the stability and efficiency of perovskite solar cells.”

The scientists are presently focused on advancing the method to fabricate full-sized solar cells.