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Nano-hillocks formation using Laser Induced Plasma for Solar Cell Application

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This research explores the utilization of laser-induced plasma as an x-ray source for material modification, focusing on analytical grade Cu target irradiating gold and platinum films for solar cell application in space. A 2D-3D perovskite film has been deposited on SnO₂ nano-rods (NRs)@compact TiO₂/FTO glass ETL layers using a novel method of thermal evaporation method. Then after deposition of HTL Au and Pt films were deposited as a top contact layer of the perovskite solar cells. These top layers were exposed by x-rays produced from laser induced plasma using Cu target. Atomic force microscopy (AFM) analysis shows heightened surface roughness and nano-sized hillock formation post-exposure, by x-rays produced from Cu plasma source. Two distinct perovskite devices are fabricated and irradiated with x-rays one have Au as top contact and other have Pt. The devices exhibit enhanced performance and stability, with the highest efficiency reaching 16.7%. The strategic use of horizontally placed SnO₂-NRs contributes to improved device performance and stability, highlighting the potential of this approach for future perovskite-based solar cell technologies.