Skysong Innovations
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Apparatus and Method for the Formation of Metal-Halide Perovskite Films

Background

Perovskite photovoltaic cells have demonstrated high efficiencies at small scales, both on their own and in conjunction with a bottom cell (such as silicon) to form a tandem. One challenge to scaling up the production of perovskite photovoltaic cells is the lack of effective methods that form uniform perovskite films over different sizes of substrates. Current methods involving the production of perovskite or silicon tandem solar cells face challenges, including lower throughput, less yield, and higher cost. There is a need for manufacturable perovskite film deposition techniques, especially on textured surfaces (e.g., silicon substrates) with the ability for the perovskite film to conform to the textured surface.

Invention Description

Researchers at Arizona State University have developed a novel technique that enables the deposition of metal-halide perovskite thin films. This technique includes both the equipment and method for depositing thin films on any substrate in a linear fashion, including webs, wafers, and glass sheets. The resulting films are uniform and dense, with few defects and high external radiative efficiency. These films can be made to conform to textured surfaces as needed for photovoltaic and other optoelectronic device applications. This technique is scalable to coatings larger in size (e.g., meters wide) with line throughputs of several meters per minute.

Potential Applications

- Photovoltaic cells
- Optoelectronic devices

Benefits & Advantages

- Easily adjustable to obtain desired film composition (feedstock material is perovskite inks)
- Does not produce point defects or edge defects (distributes droplets uniformly over substrate surface)
- Enables conformal deposition of textured surfaces
- Compatible with other processing techniques
- High external radiative efficiency
- Scalable to larger size coatings

Related Publication: Aerosol impaction-driven assembly produces evenly dispersed nanoparticle coating on polymeric water treatment membranes.