Electrodepositing switchable photovoltaic window electron and hole transport layers

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Vertical glass facade buildings, such as skyscrapers, have significant potential for generating electricity using solar window technologies, such as SwitchGlaze, a switchable photovoltaic window. This window contains a perovskite layer that absorbs visible and UV light.

To commercialize this and other perovksite solar cells, it is essential to optimize a scalable production process, such as electrodeposition, which can controllably fabricate stable transport layers. This technique can then be used to fabricate back contact solar devices to decrease delamination occurrence and allow for more sunlight to directly interact with the perovskite and increase device efficiency. Nickel oxide (NiOx) and tin oxide (SnO2), are especially promising transport layers due to their high stability and electron mobility, respectively. Both can be fabricated at room temperature and are also suitable for window technology due to their high transparency. A three-electrode system was used to determine which electrolyte concentrations, electrodeposition times, current densities, and annealing times would electrodeposit the most uniform, thinnest, and smoothest transport layers.

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