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Semi-Transparent Perovskite Solar Cells

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Abstract

Semi-transparent solar cells are a technology that combines the benefits of visible light transparency and light-to-electricity conversion. One of the biggest opportunities for such technologies is their integration into windows and skylights within energy-sustainable buildings. Currently, such building integrated photovoltaics are dominated by crystalline silicon-based modules; however, the opaque nature of silicon creates a unique opportunity for emerging photovoltaic candidates, which can be made truly semi-transparent. Metal halide perovskite PV could very well represent this opportunity, having rapidly emerged as a disruptive technology by being low cost and providing solar-to-electricity conversion efficiencies in opaque devices of >23%. Unlike polycrystalline silicon and thin-film technologies, here we show that perovskites can be deposited as ultra-thin layers to enable semi-transparency across the visible spectrum, while still maintaining an efficiency of up to ~15%. Critical to this work is the development of high quality semi-transparent electrodes. In this poster we show progress towards developing stable electrodes with high transparency by comparing dielectric-metal-dielectric stacks to conventionally sputtered electrodes as suitable candidates for such devices. This work is part of a recently funded ARENA project looking at developing semi-transparent solar cell windows.