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## Novel atmospheric process for large area perovskite solar cells via modified 2 step method

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Lead halide perovskite solar cells (PVSCs) have been exhibiting high efficiency by using abundant materials and availability on flexible substrates with easy fabrication process. However, to fabricate the perovskite devices for large area are facing many problems such as surface coverage and quality of perovskite crystalline thin film. Here, we report the way to fabricate perovskite solar cell outside glovebox (humidity less than 40%) for small and large scale area by modifying the 2 step method with structure FTO/TiO<sub>2</sub>/Perovskite/spiro-MeTAD/Au. The modification of 2 step method is based on the “spin-washing” during the second step: methylammonium iodide solution dipping. The films after dipping were washed with IPA at difference spin speed in order to remove non-reactive material on the surface of perovskite thin film. We observed perovskite crystalline morphology was changed when we change the washing spin speed. Finally, we succeeded to fabricate perovskite solar cell outside glovebox and observed the maximum PCE for small devices (0.09 cm<sup>2</sup>) at 12.7% and large area devices(1 cm<sup>2</sup>) at 10.3%.

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