

Gammavoltaic property of perovskite solar cell toward the novel nuclear power generation

Radiovoltaic devices can directly convert high-energy from radio-isotopes to electrical power through the generation and split the electron hole pairs in semiconductors. Here, in this study, energy harvesting through the gammavoltaic effect of $\text{CH}_3\text{NH}_3\text{PbI}_3$ perovskite solar cell was examined for aiming the novel nuclear power generation system. Two radiation sources Co-57 (100kBq, 1.33MeV for Gamma) and Cs-137 (10kBq, 0.66MeV for Gamma) with $\phi 25 \times 4$ mm disc shape were used for our experiment. They are commercially available from Japan Radioisotope Association (JRIA). The working area size of perovskite solar cell was 3×10 mm on top of FTO substrate.

The resulting current was monitored by MPPT machine (PV Power Analyzer KV-PA-Pico, SPD Laboratory Inc.) and showed almost double of background noise level, 100nA under the two-piled radiation sources. Another type of solar cell such as c-Si and QD-PbS was examined but they could not show significant power generation. The other system having perovskite solar cell and thallium doped CsI crystal scintillator as a light source under the gamma radiation was also examined. Further detail will be discussed.