# Performance enhancement of mesoporous $TiO_2$-based perovskite solar cells by $SbI_3$ interfacial modification layer

**Putao Zhang, Fu Yang, Muhammad Akmal Kamarudin, Chi Huey Ng, Gaurav Kapil, Tingli Ma, Shuzi Hayase***
***E-mail: hayase@life.kyutech.ac.jp**

Abstract: $TiO_2$ is commonly used as electron transporting materials in perovskite photovoltaic devices due to its advantages, including suitable band gap, good photoelectrochemical stability and simple preparation process. However, there are many oxygen vacancies or defects on the surface of $TiO_2$ and thus this affect the stability of $TiO_2$ based perovskite solar cells under UV light. In this work, a thin (monolayer) $SbI_3$ modification layer is introduced on mesoporous $TiO_2$ surface and the effect at the interface between of $TiO_2$ and perovskite is monitored by using quartz crystal microbalance system. We demonstrate that the $SbI_3$-modified $TiO_2$ electrodes exhibit superior electronic properties by reducing electronic trap states, enabling faster electron transport. This approach results in higher performances compared with that without $SbI_3$ passivation layer electrodes. $CH_3NH_3PbI_3$ perovskite solar cells with a maximum power conversion efficiency of 17.33% in air, accompanied by a reduction in hysteresis and enhancement of the device stability are reported.