**Link:** <https://solar-power-tech.com/e-posters/pss_eposter_012/>

**Abstract**

Measurement and understanding of electrochemical impedance spectra of perovskite solar cells (PSCs) are non-trivial, as perovskite absorbers are a mixed conductor exhibiting both ionic and electronic motion. Moreover, the interpretation of the low-frequency spectra especially low-frequency resistance (RLF) is ambiguous. Some reports suggest that RLF is related to ionic transport resistance, while others attribute it with the recombination processes.1Here, we experimentally shed more light on the quest of low-frequency impedance spectra in efficient PSCs. We confirm that high and low frequency resistances (RHF and RLF) follow a similar dependence on the applied bias and illumination with a comparable slope. We correlate both the resistances to be associated with the recombination process in PSCs. Moreover, we also confirm that the low-frequency capacitance (CLF) and RLF exhibit the similar slope but with the opposite dependence on the applied bias and illumination in line with the previous study by Zarazua et al,2 which signifies the electrical components are related to each other. These observations establish the fact that recombination in PSCs is mainly defined by the resistive elements RHF and RLF obtained from EIS spectra. In the next step, we rigorously analysed the EIS spectra to establish the dependence of low-frequency spectra of PSCs on the physical parameters such as the role of interface, grains size and perovskite compositions. To the best of our knowledge, the dependence of low-frequency impedance on these parameters is rarely discussed in the literature.3,4 We find that the low-frequency spectra of PSCs mainly dependent on the grain size and devices with larger grain size exhibit lower recombination and higher open-circuit voltage. We found that an increase in grains size shifts the low-frequency peak towards the higher frequency, i.e towards faster time constant. The present study provides a convenient way for in-depth analysis of PSCs, which will be crucial for designing better performing PSCs.