10th Global Summit on
Renewable Energy and Resources
June 27-28, 2024 | London, UK
Volume: 14

Active Layer Additives and Passivation for Improving the Performance of Perovskite Solar Cells

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The research on perovskite solar cells (PSCs) is at the vanguard of many current research fields, due to its promising potential in the energy sector. Perovskites are severely limited by their instability upon exposure to moisture and air. Researchers have opted for different methods to stabilize the cells which include passivating the perovskite layer. A simulated model using GPVDM/OghmaNano was constructed for a perovskite having the structure of FTO/TiO2/perovskite/Spiro-OMeTAD/Au. A fully working model was then fabricated having the same structure but using four different bulk passivating agents (Flavanone, Carotene, Baicalein, and Naringenin) each with four different concentrations. The passivators are antioxidants and were chosen based on their stabilizing features as well as their low health hazards. TRPL, UV-Vis, XRD, FE-SEM, FTIR, and the Litos Lite characterization were used. FTIR measures the bandgap of the cell. XRD results showed the crystallinity of the cell. The concentrations were optimized based on the TRPL results that showed an enhanced carrier lifetime for Carotene and Flavanone when compared with pristine perovskite, Naringenin, and Baicalein. An improvement in the crystal structure was noticeable in the FE-SEM pictures of Carotene and Flavanone. The UV-Vis shows enhanced absorption for the passivated samples, further proving the positive effect that the passivator had on the cell. With the use of Litos Lite the PCE was obtained for the best three concentrations of Carotene and Flavanone having the highest efficiencies for both, 20.97% and 18.71%, respectively, compared with the pristine perovskite efficiency of 17.43%.

Biography

Hasan Ahmad Kanjo is a Fresh Graduate studied Sustainable and Renewable Energy Engineering at the University of Sharjah (UOS). Along with his studies, he work as a research assistant Engineer at UOS, currently focusing on developing 3rd generation solar cells. He is passionate about enhancing his knowledge and skills to tackle the challenges of the modern world and have gained valuable experience through working with online companies. He have also taken part in various events and competitions related to robotics and clean energy, displaying my dedication to sustainability and innovation.