

Supplementary Information

Nickel Oxide embedded with Polymer Electrolyte as Efficient Hole Transport Material for Perovskite Solar Cell

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Materials Used

Transparent titanium dioxide (TiO₂) paste was purchased from Solaronix, Switzerland and sodium hydroxide (NaOH) pellets were purchased from Fisher Scientific. Potassium iodide (KI) and iodine (I₂) were purchased from Himedia, India. N,N-dimethyl formamide (DMF), methylamine, hydro iodic acid (HI, 55 wt. % in water), ethanol and petroleum ether were purchased from Thomas Baker, India while Ti(IV) bis(acetoacetato)-diisopropoxide (blocking layer) solution, lead iodide (PbI₂), polyethylene oxide (PEO), hexachloroplatinic acid (H₂PtCl₆), nickel chloride hexahydrate (NiCl₂.6H₂O), and fluorine doped tin oxide (FTO) (resistivity 8 Ω/sq) were purchased from Sigma Aldrich, USA. Double distilled (DD) water prepared in laboratory was used wherever required. The procured chemicals were used as received without any further purification.



Fig. S1: Bulk NiO Powder

Materials Characterization

For surface morphology analysis, the films were deposited on a 1×1 cm glass slide and ZEISS EVO 50 SEM was used with an acceleration voltage of 15 kV.

For assessing the elemental composition of the samples RONTEC's EDX system model QuanTax 200 attached to the SEM instrument was used.

For XRD analysis of perovskite, the solution was spin-coated on a glass slide and sintered at 70°C for several minutes while for NiO, the powder was uniformly spread on the glass slab. X'Pert PRO model was used having an operating voltage of 15 kV.

The photovoltaic performance of the PSC was evaluated by its J–V characteristics, which was carried out using CHI 604D electrochemical workstation. A 150 W halogen lamp was used as the light source, which was kept at a certain distance, simulated to give 1 sun condition.

The impedance analysis was also carried out by the electrochemical workstation in the frequency range of 100 kHz to 0.1 Hz and an amplitude of 5 mV under 1 sun condition.

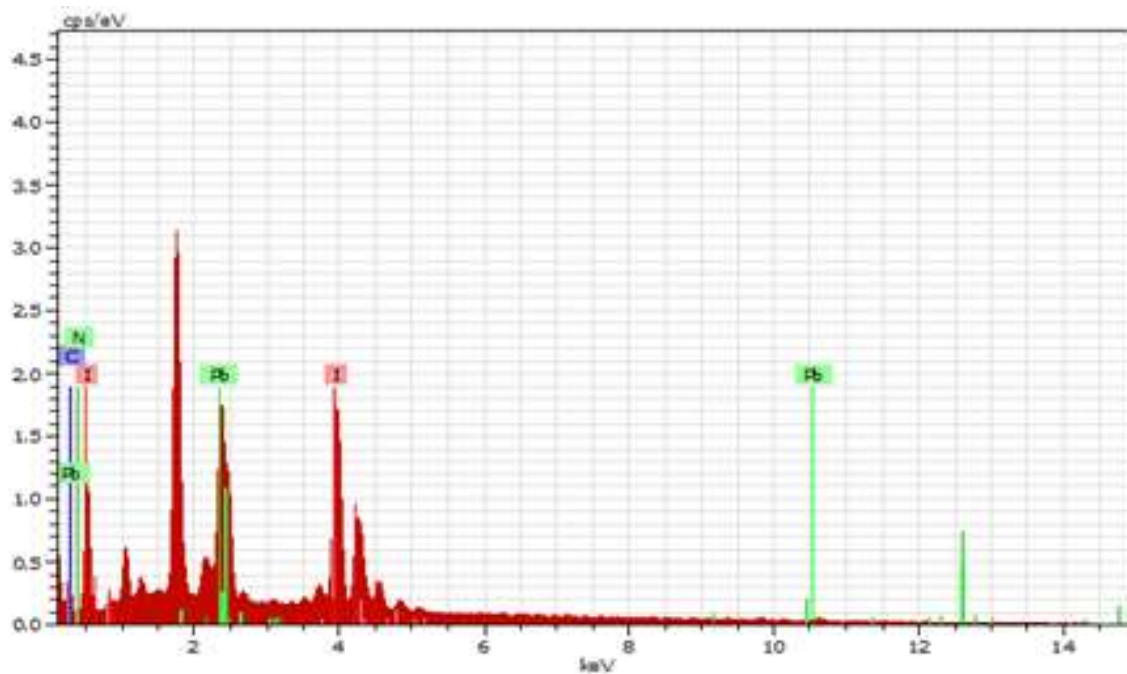


Fig. S2: Elemental analysis of MAPbI₃

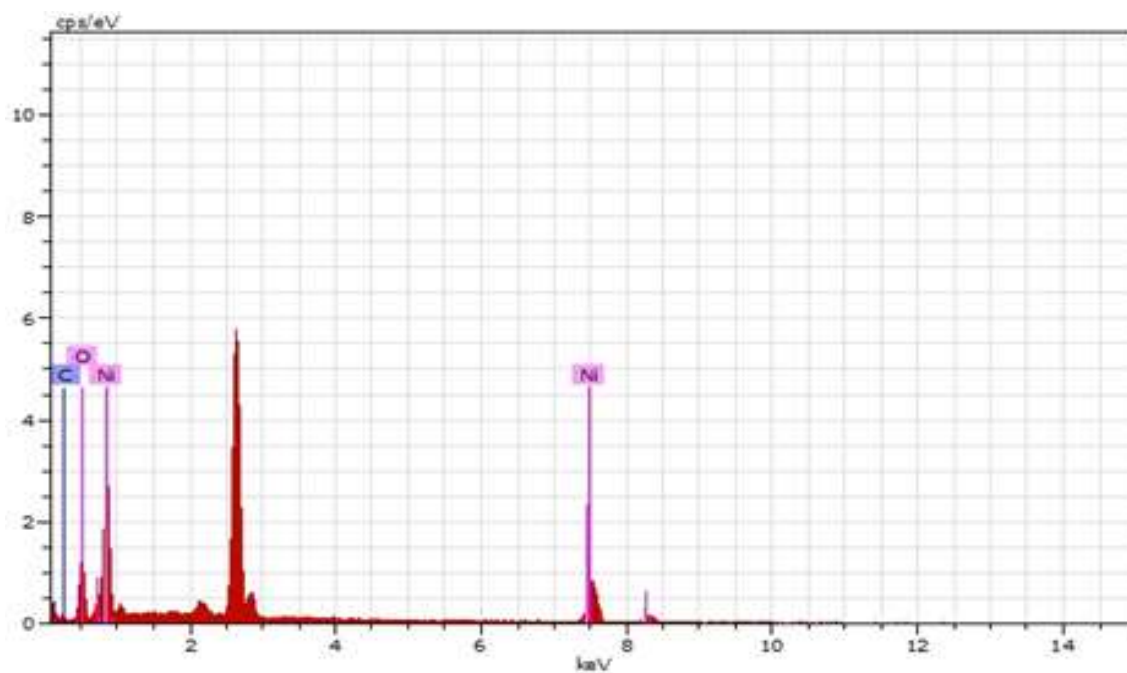


Fig. S3: Elemental analysis of NiO