# Perovskite solar cells using polymer electrolytes

## ABSTRACT

This study deals with the characterization of methylammonium lead iodide (MAPbI3) material and the fabrication of perovskite solar cells using gel polymer electrolyte as the charge transport medium. The crystalline lead–based perovskite has been verified by x-ray diffraction (XRD). The [100], [200], [210], [211], [220], [300] and [222] reflection planes can be observed at 2θ angles of 14.10°, 28.35°, 31.90°, 34.95°, 40.40°, 43.15° and 50.20°, indicating a cubic crystal symmetry for CH3NH3PbI3. EDX spectrum showed a Pb:I ratio of approximately 1:3 as in CH3NH3PbI3. The band gap for lead-based perovskite is 1.45 eV estimated from UV-Vis absorption spectroscopy. The nanocrystalline MAPbI3 have been observed using field emission scanning electron microscopy (FESEM), where the average cuboid size of perovskite nanocrystals is 380 nm. The cell have been fabricated using gel polymer electrolyte with composition 17.02 wt.% PVA–13.93 wt.% TBAI–0.96 wt.% I2– 68.09 wt.% DMF. The cell exhibits a power conversion efficiency (PCE) of 1.28% with open circuit voltage (Voc) 0.58 mV, short circuit current density (Jsc) 3.74 mA cm−2 and fill factor (FF) 59.18%.

**Keyword:** Gel polymer electrolyte; Transport properties of charge carriers; Perovskite solar cell; FESEM; UV-Vis