

SYNTHESIS, CHARACTERIZATION AND APPLICATION OF Cu_2HgI_4 , $\text{C}_6\text{H}_5\text{NH}_3\text{PbI}_2\text{Cl}$, $\text{CH}_3\text{NH}_3\text{PbI}_3$ AND BaCuI_3 IN SOLAR CELLS

M. Sarathchandra

Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka
Department of Chemistry, University of Peradeniya, Peradeniya, Sri Lanka

Copper(I) tetraiodomercurate(II) (Cu_2HgI_4), phenylammonium chlorodiiiodoplumbate(II) ($\text{C}_6\text{H}_5\text{NH}_3\text{PbI}_2\text{Cl}$), methylammonium triiodoplumbate(II) ($\text{CH}_3\text{NH}_3\text{PbI}_3$) and barium triiodocuprate(I) (BaCuI_3) are solid state compounds. Copper(I) tetraiodomercurate(II) (Cu_2HgI_4) is used in dye sensitized solid state solar cell due to its high ionic conductivity. Phenylammonium chlorodiiiodoplumbate(II) ($\text{C}_6\text{H}_5\text{NH}_3\text{PbI}_2\text{Cl}$) and methylammonium triiodoplumbate(II) ($\text{CH}_3\text{NH}_3\text{PbI}_3$) are used as p-type solid electrolytes in solid state solar cells. They are also used as photosensitizers with I_3^-/I^- liquid electrolyte. Above compounds were synthesized from solid state reactions and they were characterized from X-ray diffraction. I-V curves were obtained for solar cells which were made with copper(I) tetraiodomercurate(II) (Cu_2HgI_4), phenylammonium chlorodiiiodoplumbate(II) ($\text{C}_6\text{H}_5\text{NH}_3\text{PbI}_2\text{Cl}$) and methylammonium triiodoplumbate(II) ($\text{CH}_3\text{NH}_3\text{PbI}_3$). Best efficiency can be obtained for solar cell of copper(I) tetraiodomercurate(II) (Cu_2HgI_4) with J_{sc} (short circuit current density) = 1.118 mA cm^{-2} , V_{oc} (open circuit voltage) = 0.486 V, FF (fill factor) = 0.368, $\eta\%$ (efficiency) = 0.200%. Best result for solar cell of phenylammonium chlorodiiiodoplumbate(II) ($\text{C}_6\text{H}_5\text{NH}_3\text{PbI}_2\text{Cl}$) is given when phenylammonium chlorodiiiodoplumbate(II) ($\text{C}_6\text{H}_5\text{NH}_3\text{PbI}_2\text{Cl}$) is used as photosensitizer while I_3^-/I^- liquid electrolyte is used. Efficiency for solar cell of methylammonium triiodoplumbate(II) ($\text{CH}_3\text{NH}_3\text{PbI}_3$) is not high as research papers which mentioned that using of evaporated metal layer as counter electrode. Even though barium triiodocuprate(I) (BaCuI_3) was synthesized from hydrothermal method, X-ray diffractogram has peaks for unreacted copper iodide.