**GERAN UTMER**

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| Research Classification | : WASTE RECOVERY - MD - RESOURCE SUSTAINABILITY |
| Category | : Science Technology (ST) |
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Title :
**Improving power conversion efficiency and the eco-friendliness of perovskite solar cell using Zn-modified hydroxyapatite**
**Maximum Duration : 24 month**
Start Date :
**01/11/2022**
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**31/10/2024**
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**2 years 0 months 0 days**
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**12**

**EXECUTIVE SUMMARY**

Perovskite solar cells (PSCs) has gained high attention since it has a wide range of advantages including high-power conversion efficiency, simple preparation process, and low cost. However, they have not been followed by commercialization since the most popular PSCs are supported by Pb which are very poisonous and destructive to environment once in contact with water.

Hydroxyapetite (HAP) is a green material that has superior ability to adsorb heavy metal ions. We previously proved that conventional HAP nanoparticles could capture some of the Pb from broken PSCs, but the Pb released was still above the safe drinking water level and devices with 100% HAP still have lower efficiency. Hence, in this project, two type of HAPs, (traditional and Zn-modified) will be prepared by chemical precipitation method to tackle high amount of Pb released, but at the same time improving the PSC's performances.

Initially, the synthesized particles will be characterized by Xray Diffractogram (XRD), Fourier Transform Infrared (FTIR), and Scanning Electron Microscopy (SEM) to determine their purity and suitability for solar cell fabrication. The fundamental Pb adsorption mechanisms for newly synthesized Zn-modified HAP with respect to the effects of initial $Pb^{2+}$ solution concentration, contact time, HAP dose and pH value on adsorption reaction will also be studied.

Upon expected high adsorption capacity achieved from these adsorption tests, these HAPs will be added to the new PSCs, and comparisons in terms of power conversion efficiency and ability to retain Pb will be made with other conventional PSCs. Ultimately, new HAP-incorporated PSC performances will be examined, and their optoelectronic quality will be analyzed. The amount of $Pb^{2+}$ released in the physical simulation (solar cell break) will also be investigated and their ability to retain Pb from release to environment will be assessed in the lights of enhancing future commercialization.