ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2023
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
09th November, 2023

Paper ID: CMT-135

Synthesis and characterization of Prussian Blue nanoparticles for low-cost electrochromic windows

M.H.I. Sewwandi[1], M.S. Kadanapitiye[2], M.N.M. Farhath[1], T. Jaseetharan[3*]

[1]*Department of Chemical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka*
[2]*Department of Nanoscience Technology, Faculty of Technology, Wayamba University of Sri Lanka*
[3]*Department of Physical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka*

[*]*jaseetharan@seu.ac.lk*

Electrochromism is the ability of certain materials to change the colour and opacity in response to an applied electric potential. Electrochromic materials and devices have gained more attention due to their extraordinary properties such as low energy consumption, low fabrication cost and flexibility etc. Prussian blue (PB) is one of the best candidates for electrochromic (EC) devices. It belongs to a category of metal-organic coordinated compounds that exhibits electrochromic properties. In the present study, Prussian blue nanoparticles (PBNPs) were synthesized using low-cost method. In order to change the optical properties, PBNPs were doped with Li^+, Na^+, K^+, Mg^{2+} and Ca^{2+} ions separately. TiO_2 nanoparticle is the one of the most popular EC materials in electrochromic window application. In this study, TiO_2/ PBNPs based electrochromic windows (ECWs) were fabricated and characterized. Polyvinylpyrrolidone (PVP) – based quasi-solid-state electrolyte was used as an electrolyte for all the ECWs. In order to enhance the performance of the device, amount of K^+ ions and PVP in the electrolyte were optimized. All optical and electrical characterizations were done under the same conditions. Electrochromic window fabricated with K^+ - doped PBNPs/TiO_2 shows a better light absorption of 74.1% around 681.9 nm wave length. And PBNPs/TiO_2 based electrochromic window requires a small electric potential of 2 V with a very small current of 0.03 mA. The best device shows a better response (forward and reverse) within 22 s.

Keywords: *Electrochromic window (ECW), light absorption, Prussian blue nanoparticles (PBNPs)*

Acknowledgement: *Authors gratefully acknowledge the financial assistance provided by the South Eastern University of Sri Lanka under the research grant number SEU/ASA/RG/2021/11*