

**Editorial note:** *The full paper of this work is transferred to  
Volume 21 of the Sri Lanka Journal of Physics; SLJoP 21 (2021)*

## **Effects of Acidification of Clove Fruit Dye Extracted in Water and Ethanol for Performance Enhancement of DSSCs**

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### **ABSTRACT**

Dye extracted from flesh of Clove fruit (*Syzygium aromaticum*) was used as the sensitizer in Dye Sensitized Solar Cells (DSSCs) of the configuration TiO<sub>2</sub>/dye/electrolyte/Pt. Pigments of Clove fruit was extracted by soaking in distilled water and ethanol and again boiling in both the solutions. Since DSSCs made using dye extraction in ethanol produced higher efficiency than in water, glacial acetic acid was added to dye extractions in ethanol at different ratios to examine any further enhancements. The Clove fruit extract absorbed appreciable solar radiation in the wavelength range 500 - 700 nm that makes it suitable for a DSSC. FTIR spectra of the dye extracts revealed the hydroxyl groups attached to dye is prominent after acidification with acetic acid that helps to anchor on TiO<sub>2</sub> surface.

DSSC fabricated using mixture of fruit dye in ethanol and glacial acetic with the ratio of 1:3 produced the highest efficiency of 0.69 % with the photo current of 2.50 mAcm<sup>-2</sup> and fill factor of 61.57 %. The electron life time calculated from bode phase plots of the cells also supported the above observations. The enhancement with acetic acid treatment of dye is attributed to intensification of absorption of visible light and strong coupling of the dye with TiO<sub>2</sub> due to the presence of anchoring groups in acidic form is evidence from UV visible and FTIR spectroscopy.

**Key words:** Clove fruit, Dye sensitized solar cells, acetic acid treatment